T06020"h2ET0660

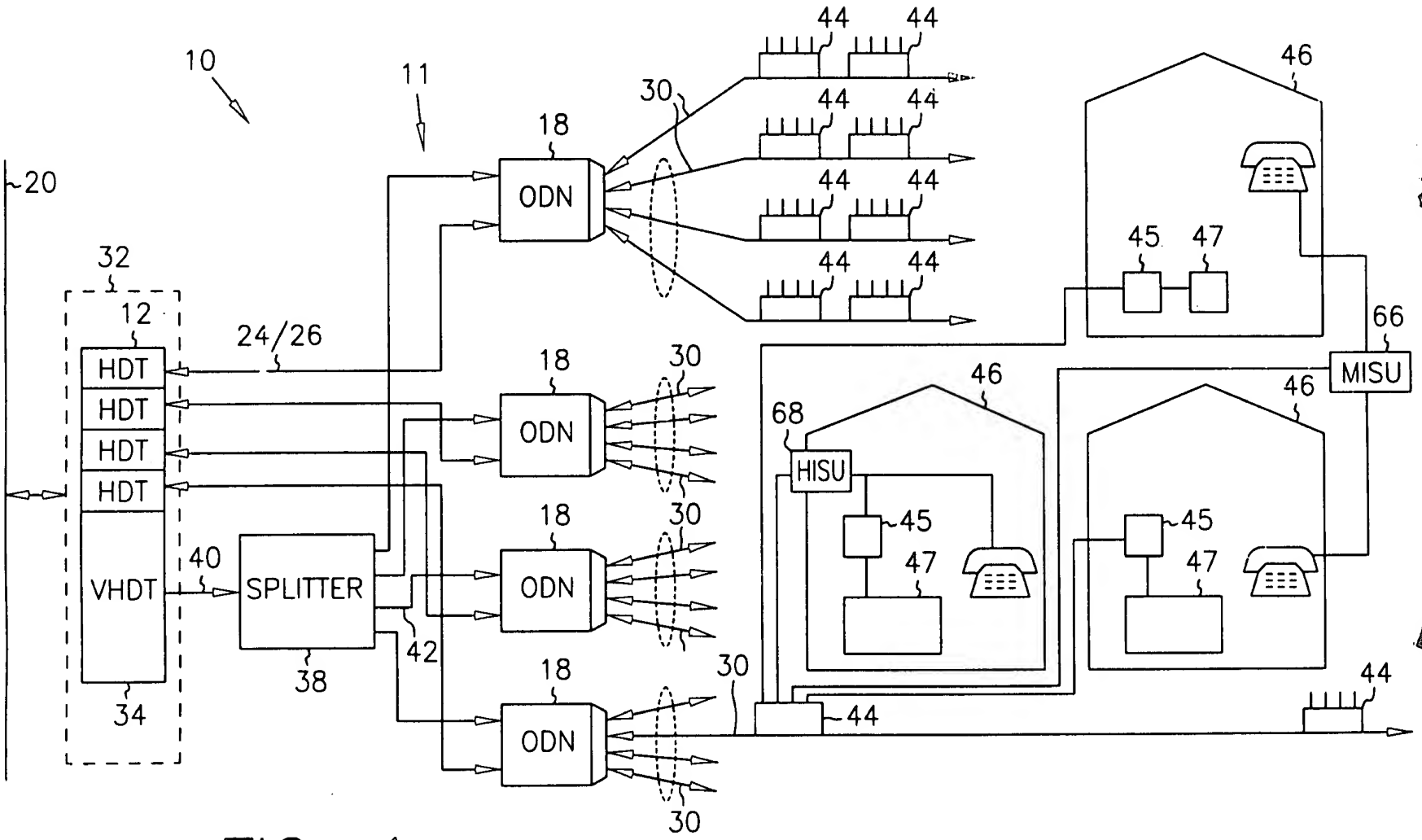


FIG. 1

TO6020 "ZETO660

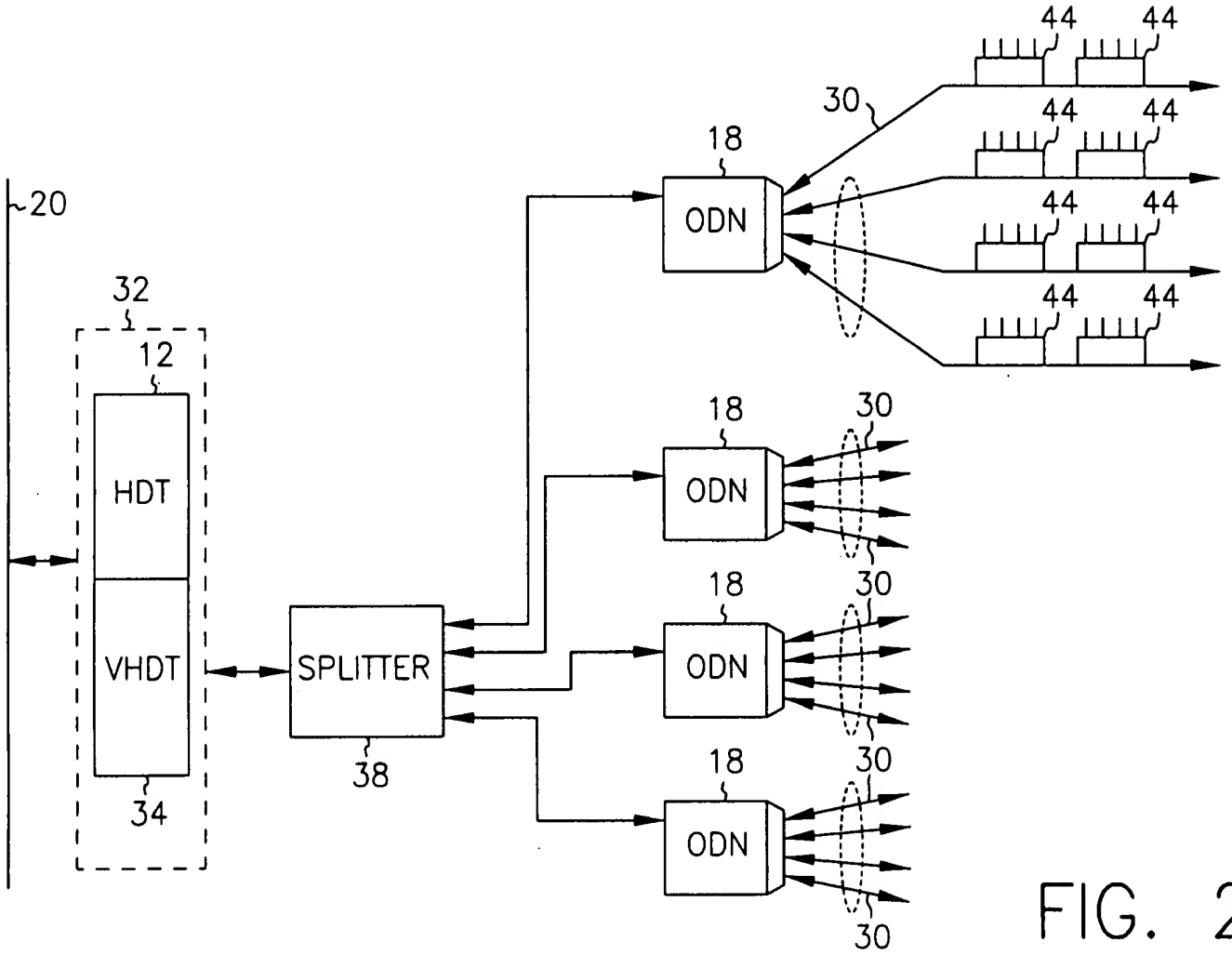


FIG. 2

T06020 "nZET0660

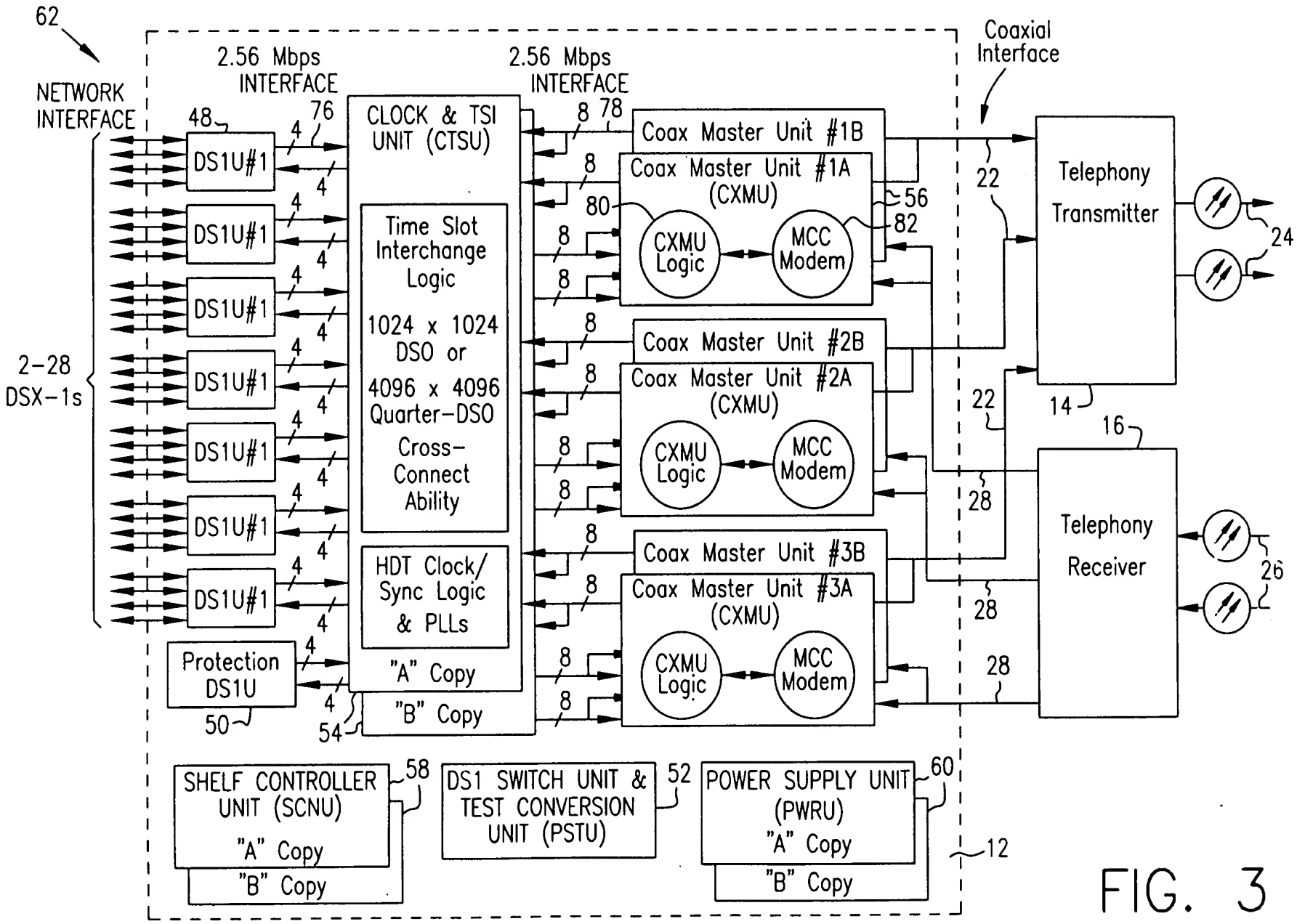
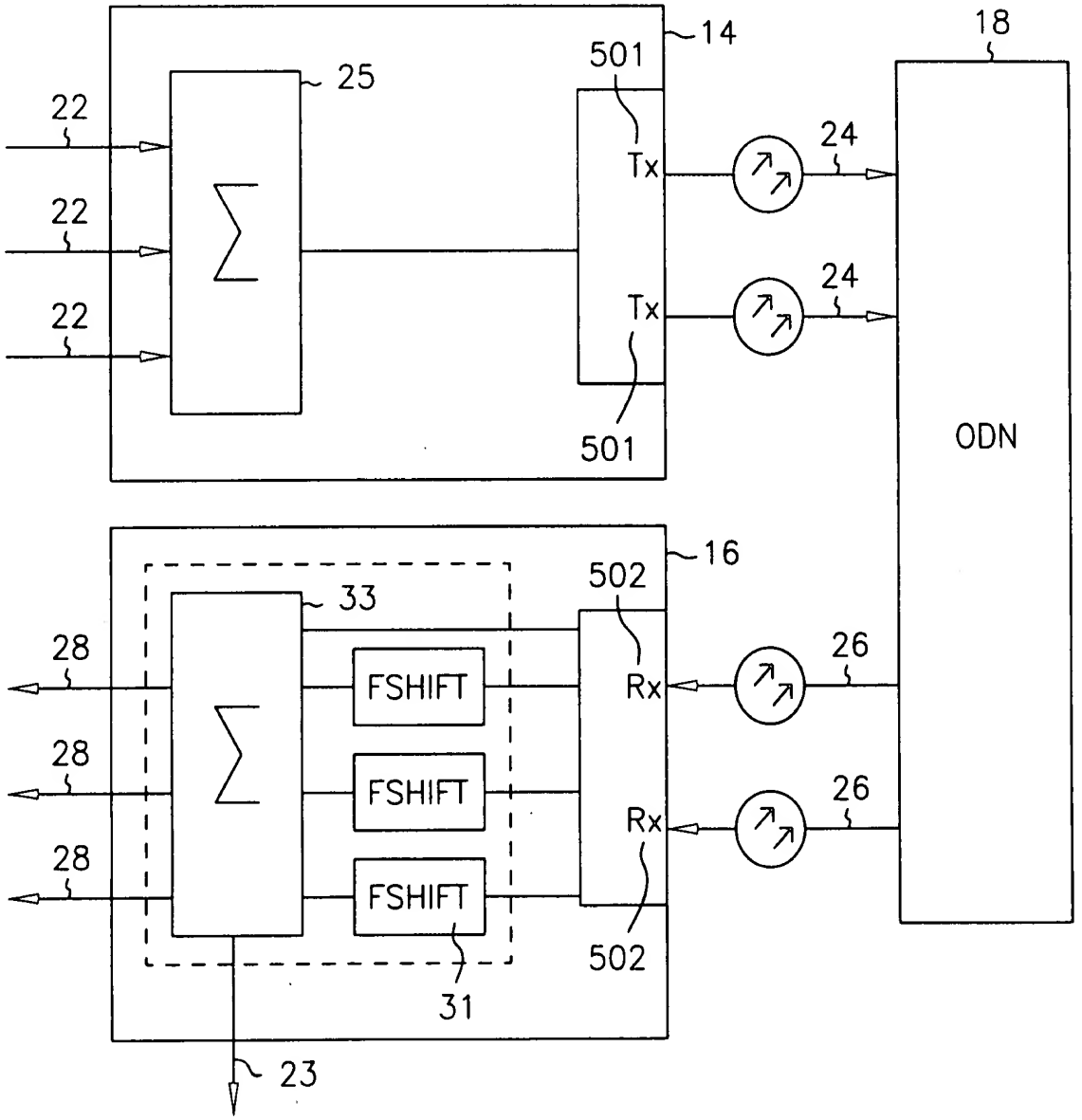


FIG. 3

FIG. 4


14
18
501
25
22
22
22
Tx
Tx
24
24
501
ODN
16
502
33
28
28
28
FSHIFT
FSHIFT
FSHIFT
Rx
Rx
26
26
502
31
23

TD6020"tZETO660

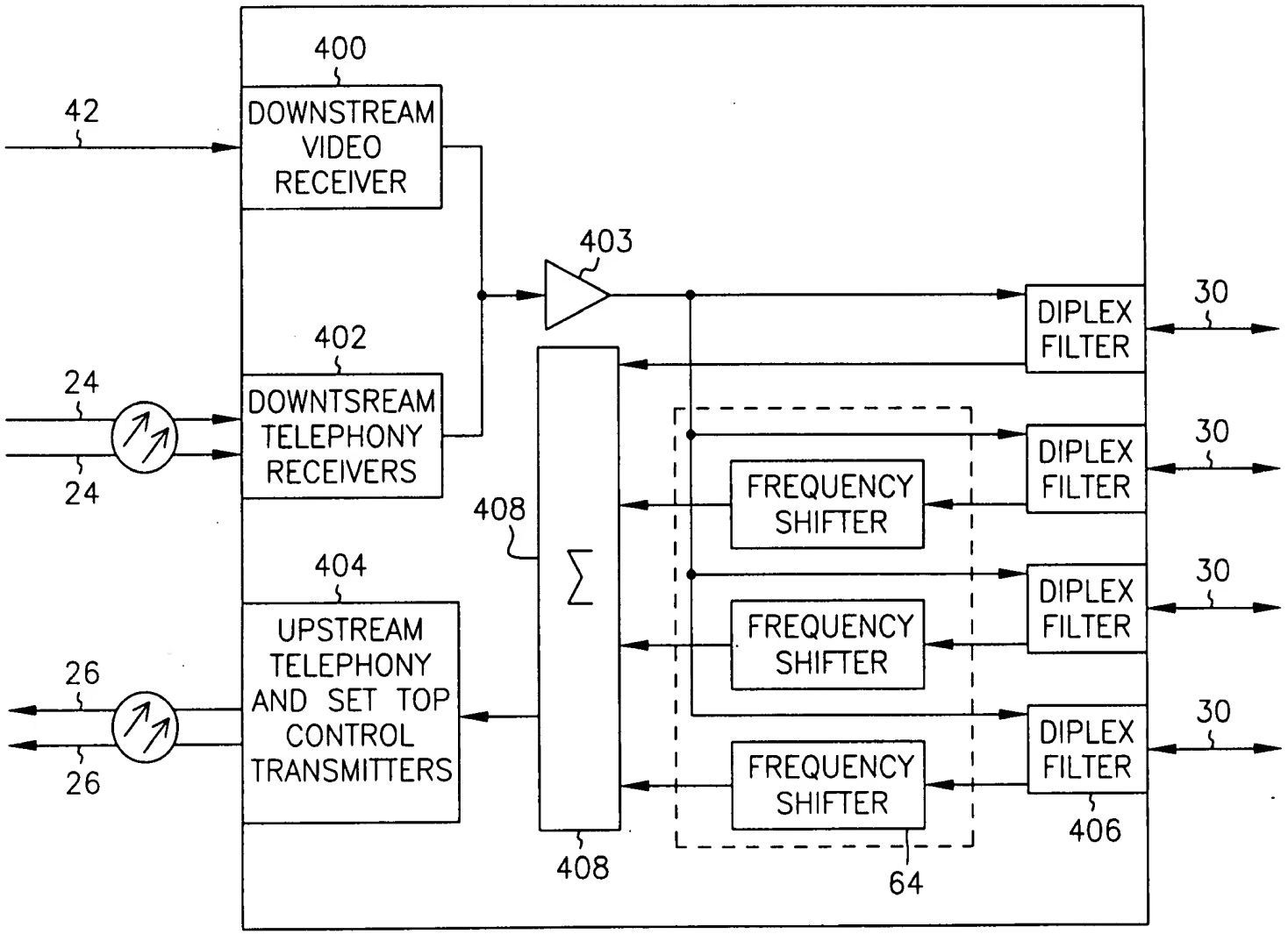


FIG. 5

T06020"t2T0660

FIG. 6

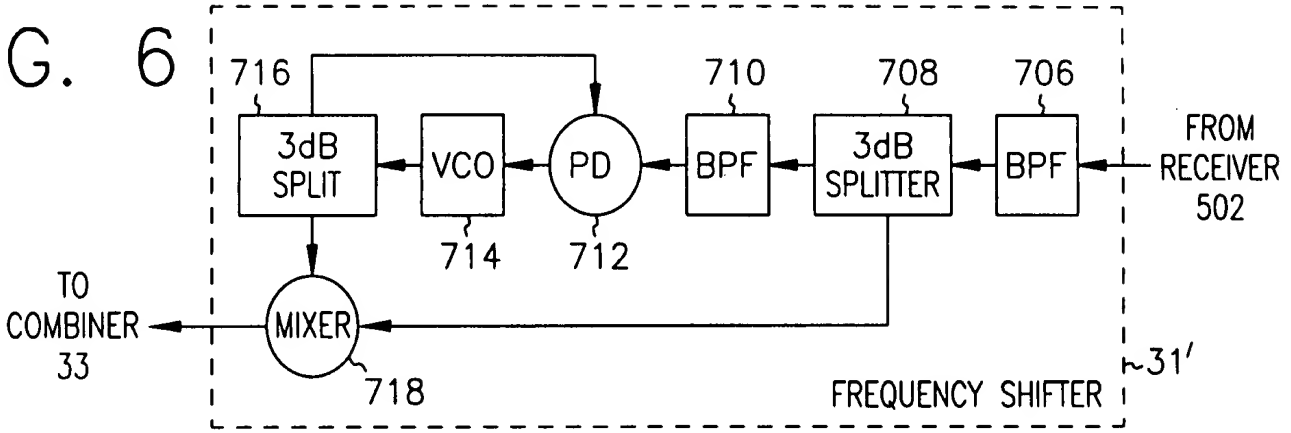
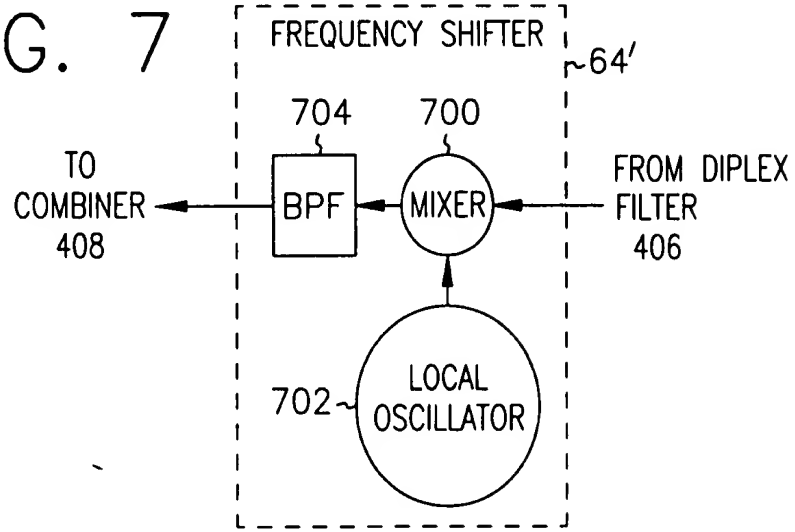


FIG. 7



T06020"h2ET0660

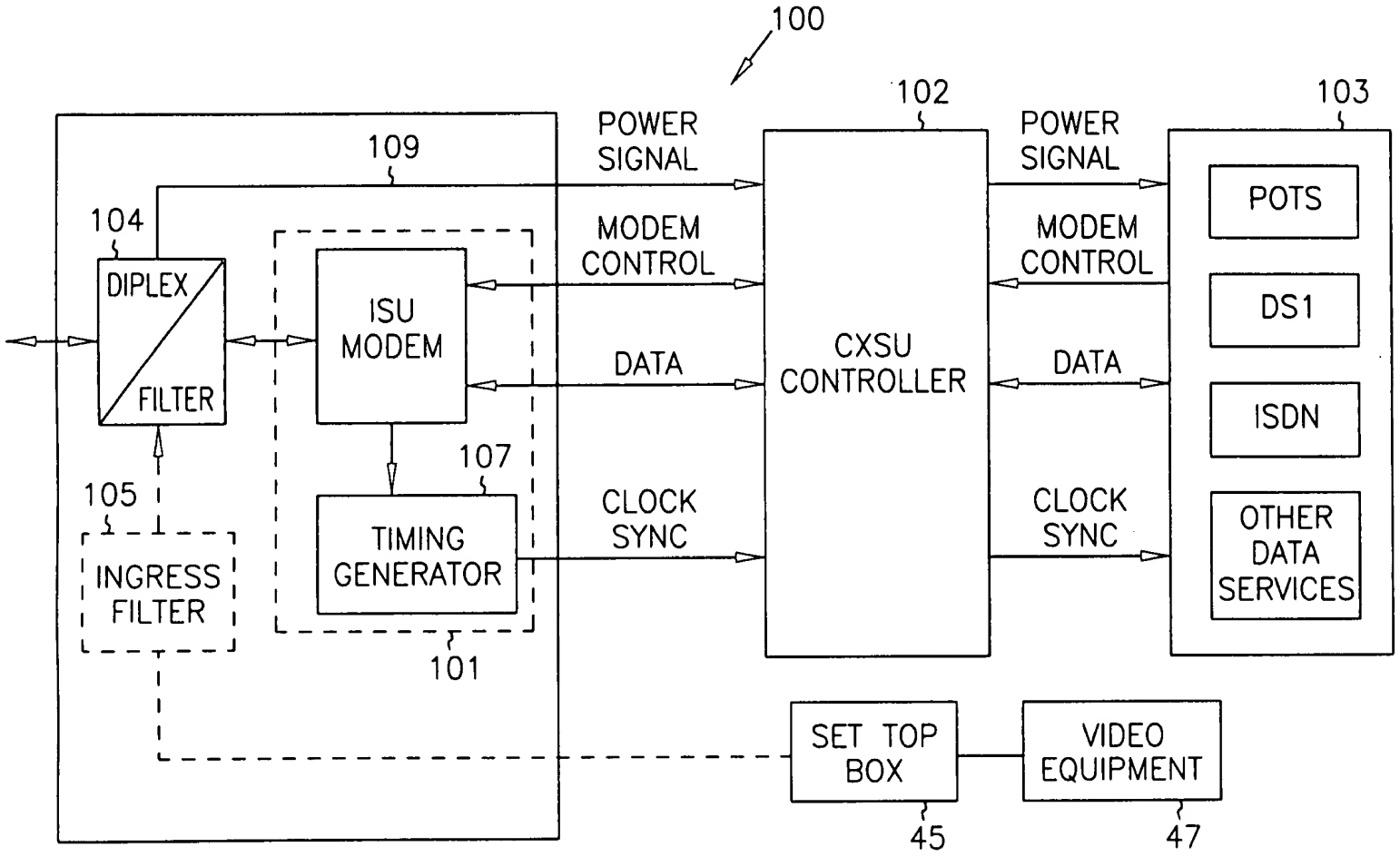


FIG. 8

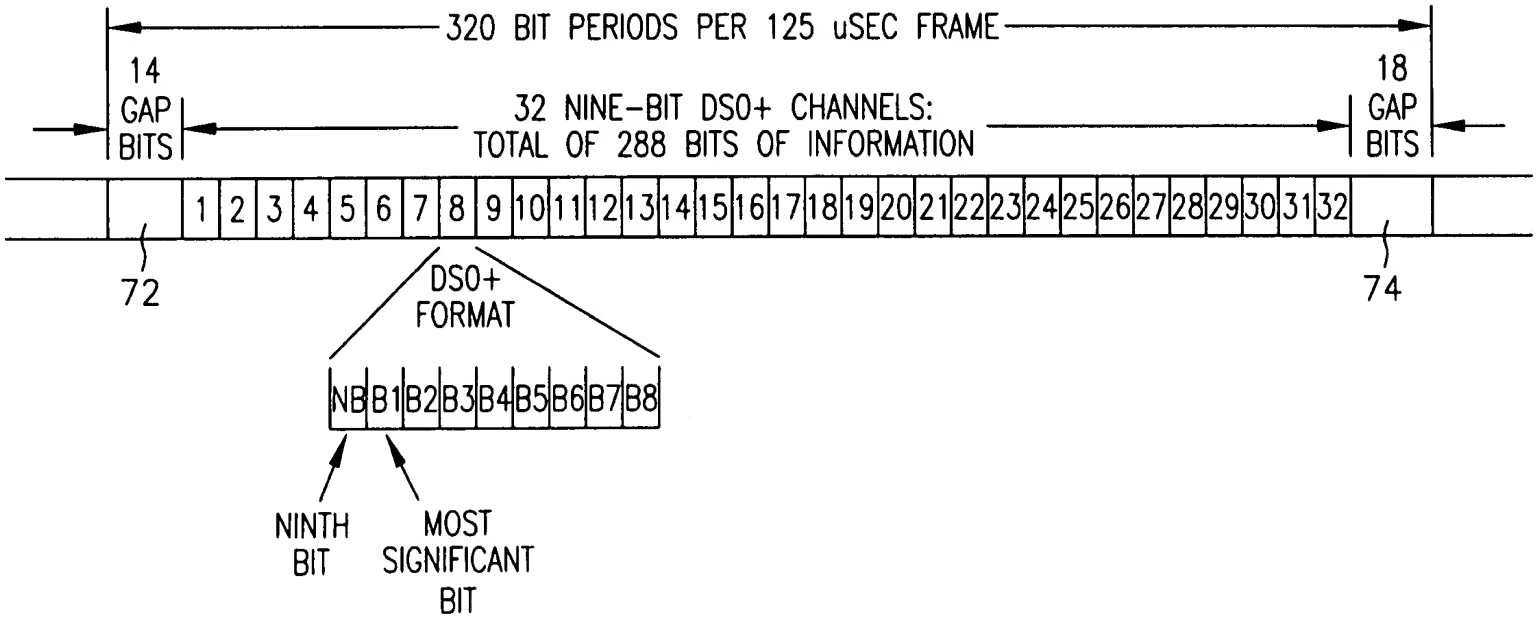

320 BIT PERIODS PER 125 uSEC FRAME
14 GAP BITS
32 NINE-BIT DS0+ CHANNELS: TOTAL OF 288 BITS OF INFORMATION
18 GAP BITS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
72
74
DS0+ FORMAT
NB B1 B2 B3 B4 B5 B6 B7 B8
NINTH BIT
MOST SIGNIFICANT BIT

FIG. 9

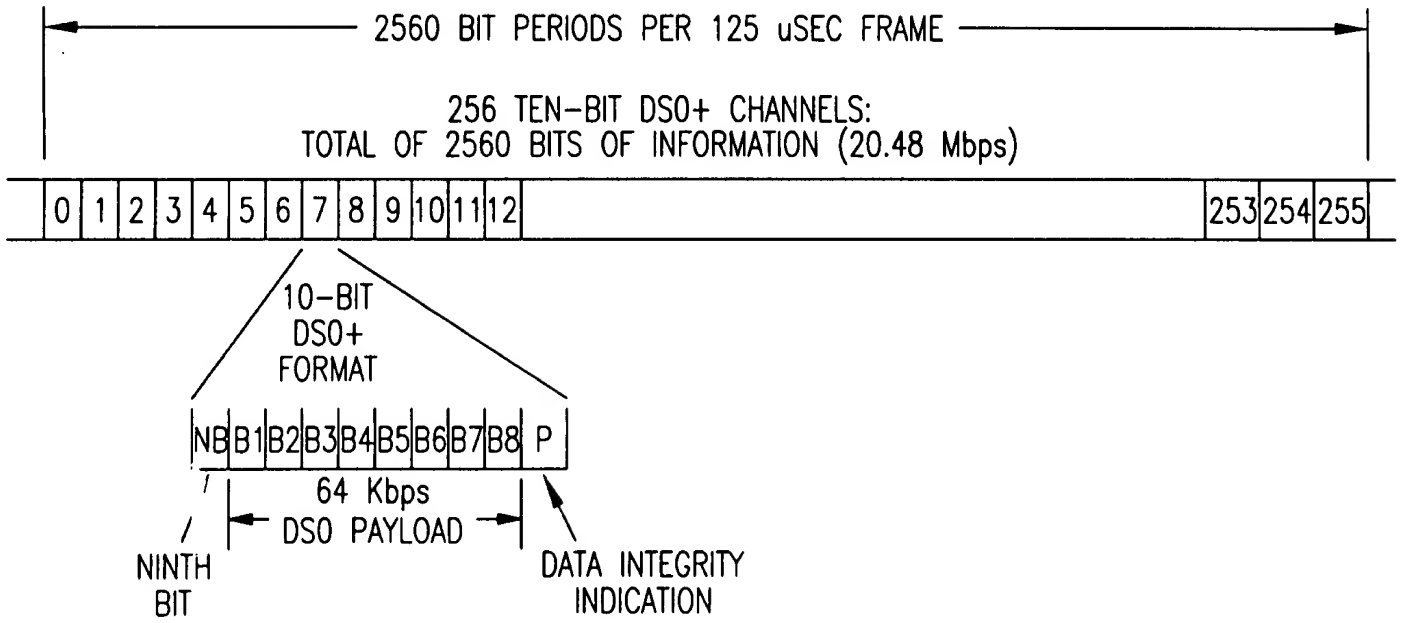

2560 BIT PERIODS PER 125 uSEC FRAME
256 TEN-BIT DS0+ CHANNELS:
TOTAL OF 2560 BITS OF INFORMATION (20.48 Mbps)
0 1 2 3 4 5 6 7 8 9 10 11 12 253 254 255
10-BIT
DS0+
FORMAT
NB B1 B2 B3 B4 B5 B6 B7 B8 P
64 Kbps
DS0 PAYLOAD
NINTH
BIT
DATA INTEGRITY
INDICATION

FIG. 10

T06020 "42E0660

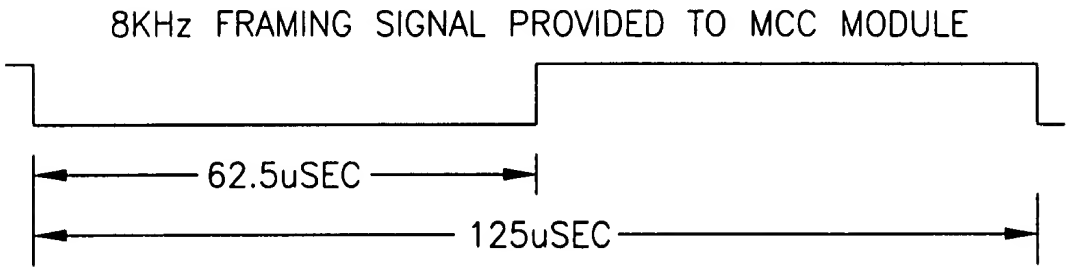


FIG. 11

T06020 "42T0660

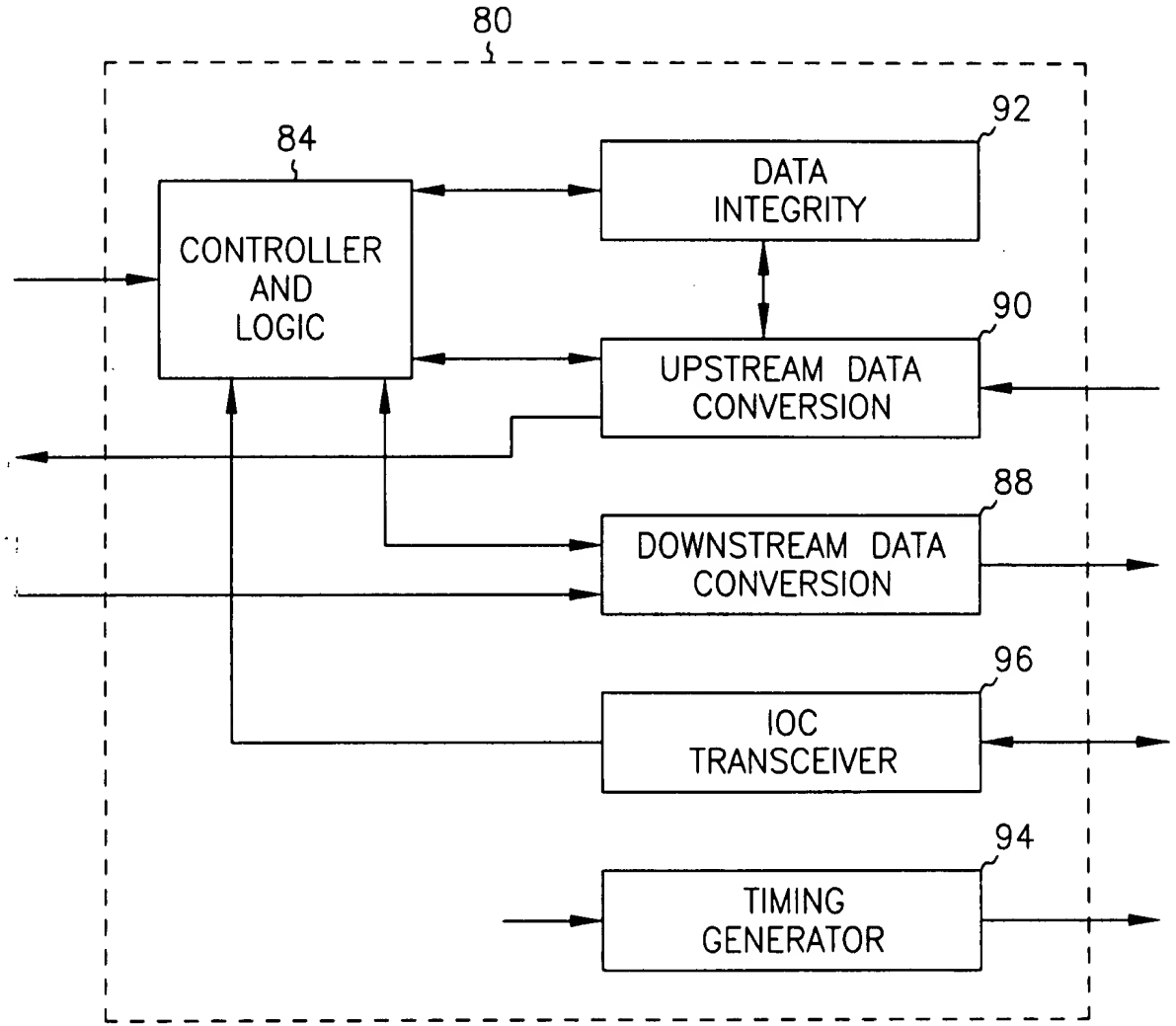


FIG. 12

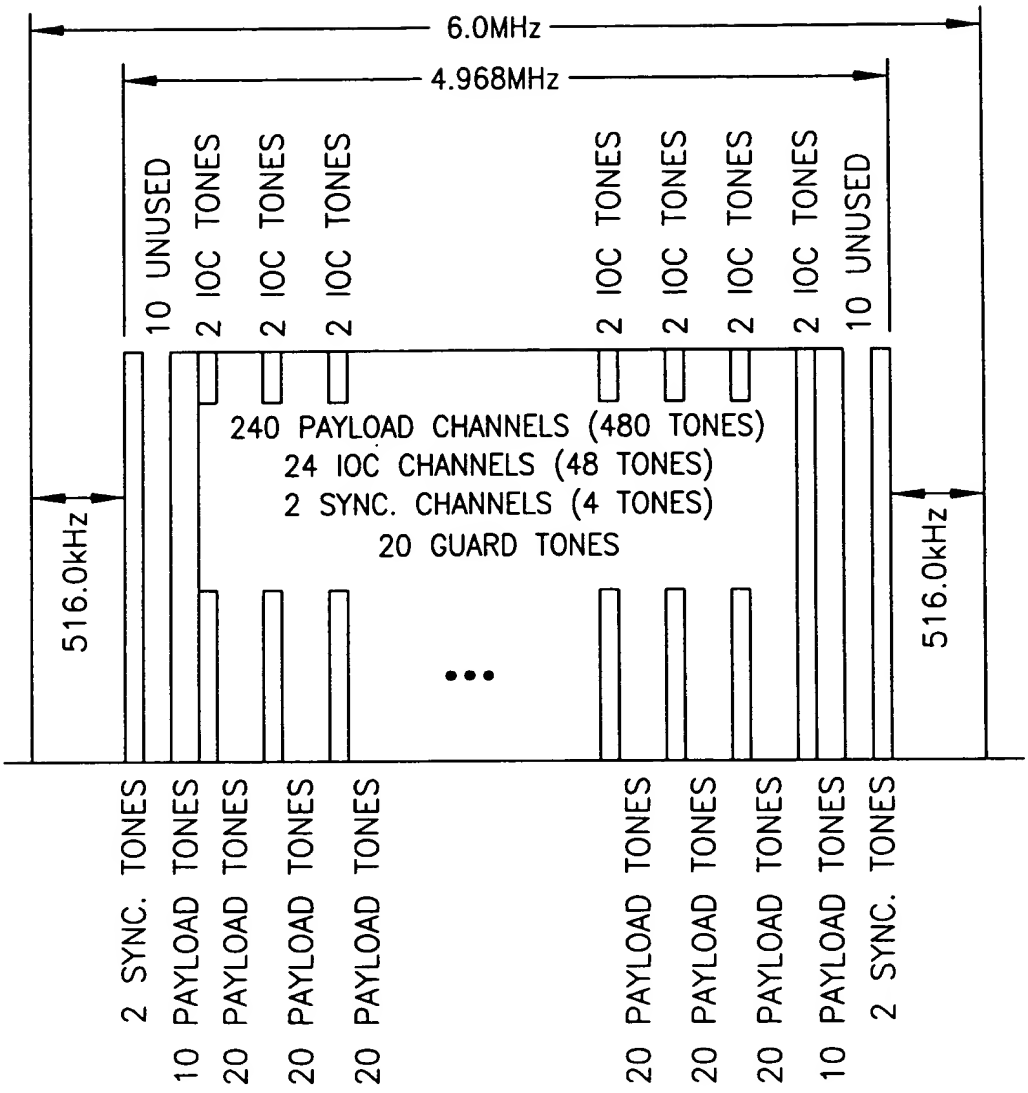

6.0MHz
4.968MHz
10 UNUSED
2 IOC TONES
2 IOC TONES
2 IOC TONES
2 IOC TONES
2 IOC TONES
2 IOC TONES
2 IOC TONES
10 UNUSED
240 PAYLOAD CHANNELS (480 TONES)
24 IOC CHANNELS (48 TONES)
2 SYNC. CHANNELS (4 TONES)
20 GUARD TONES
516.0kHz
516.0kHz
2 SYNC. TONES
10 PAYLOAD TONES
20 PAYLOAD TONES
20 PAYLOAD TONES
20 PAYLOAD TONES
20 PAYLOAD TONES
20 PAYLOAD TONES
20 PAYLOAD TONES
10 PAYLOAD TONES
2 SYNC. TONES

FIG. 13

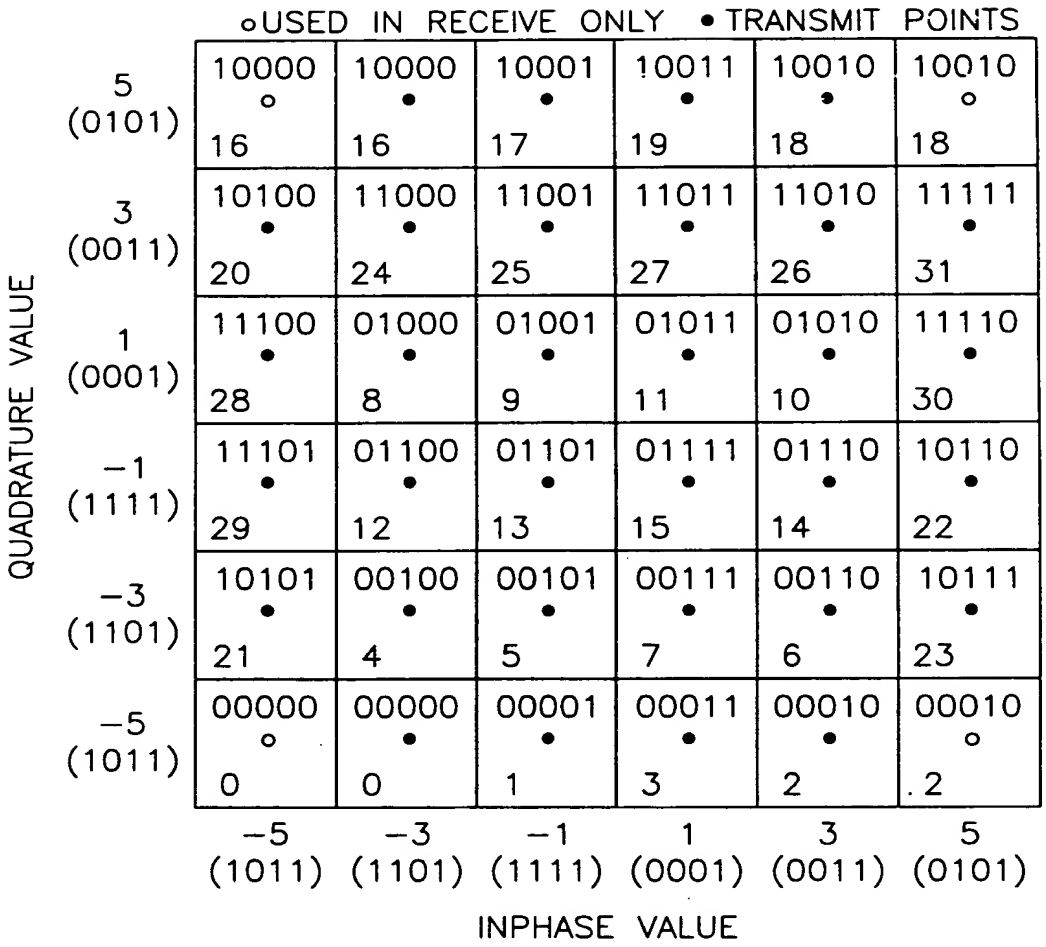

o USED IN RECEIVE ONLY • TRANSMIT POINTS
QUADRATURE VALUE
5 (0101)
3 (0011)
1 (0001)
−1 (1111)
−3 (1101)
−5 (1011)
10000 16 | 10000 16 | 10001 17 | 10011 19 | 10010 18 | 10010 18
10100 20 | 11000 24 | 11001 25 | 11011 27 | 11010 26 | 11111 31
11100 28 | 01000 8 | 01001 9 | 01011 11 | 01010 10 | 11110 30
11101 29 | 01100 12 | 01101 13 | 01111 15 | 01110 14 | 10110 22
10101 21 | 00100 4 | 00101 5 | 00111 7 | 00110 6 | 10111 23
00000 0 | 00000 0 | 00001 1 | 00011 3 | 00010 2 | 00010 2
−5 (1011) −3 (1101) −1 (1111) 1 (0001) 3 (0011) 5 (0101)
INPHASE VALUE

FIG. 14

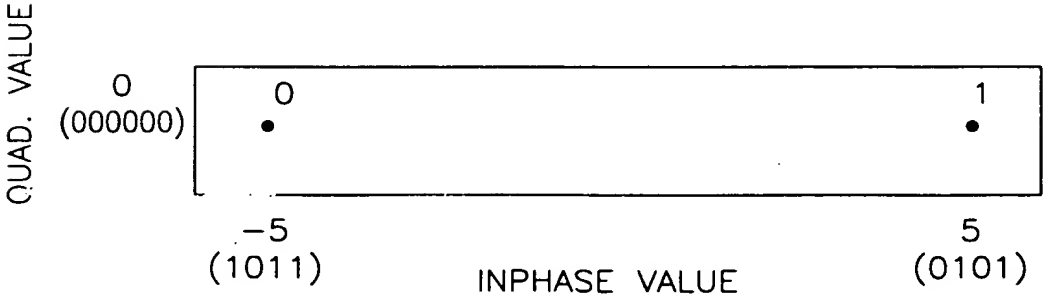

QUAD. VALUE
0 (000000)
0
1
−5 (1011)
5 (0101)
INPHASE VALUE

FIG. 15

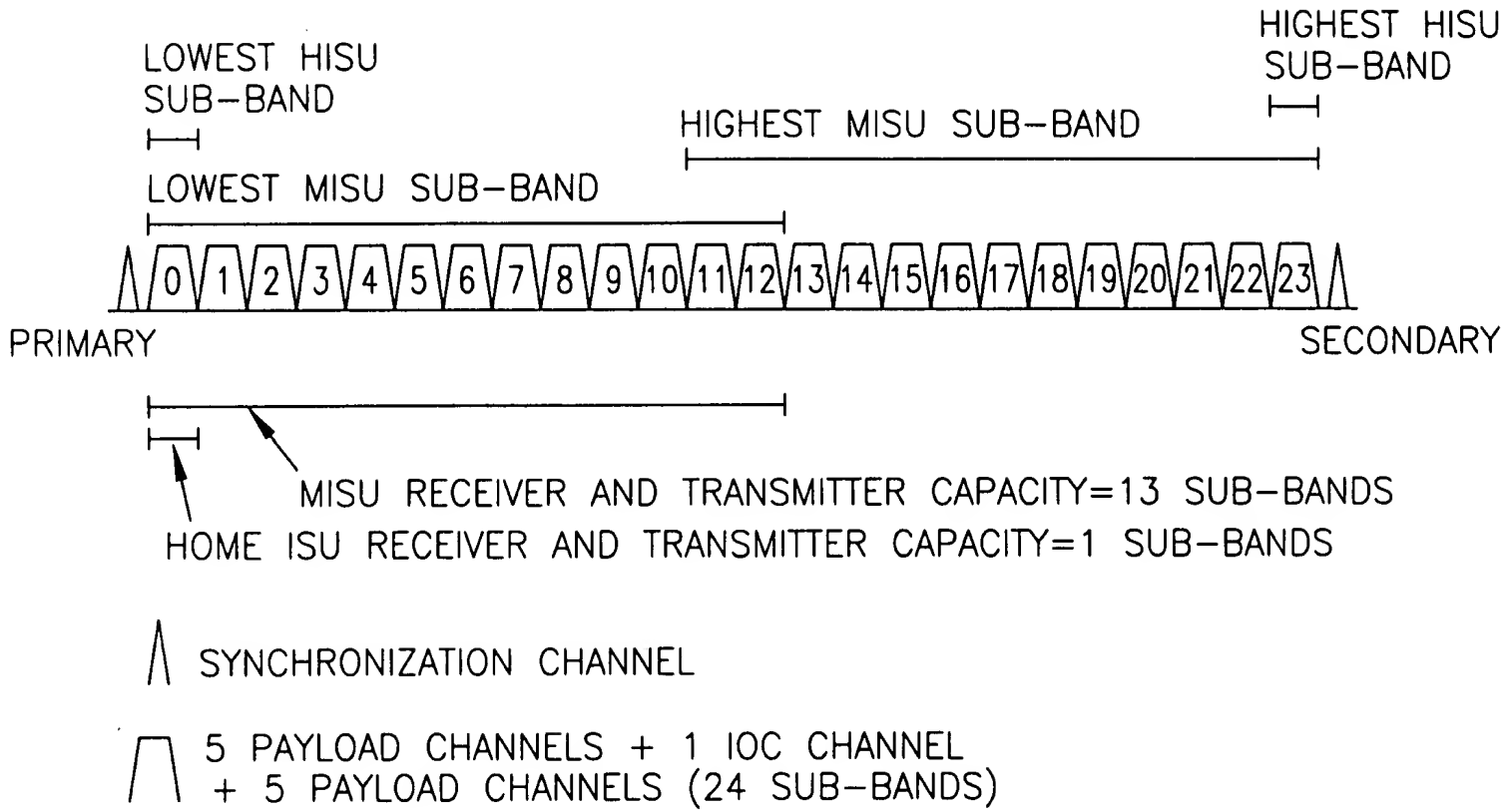

LOWEST HISU SUB-BAND
HIGHEST HISU SUB-BAND
HIGHEST MISU SUB-BAND
LOWEST MISU SUB-BAND
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
PRIMARY
SECONDARY
MISU RECEIVER AND TRANSMITTER CAPACITY=13 SUB-BANDS
HOME ISU RECEIVER AND TRANSMITTER CAPACITY=1 SUB-BANDS
SYNCHRONIZATION CHANNEL
5 PAYLOAD CHANNELS + 1 IOC CHANNEL
+ 5 PAYLOAD CHANNELS (24 SUB-BANDS)

FIG. 16

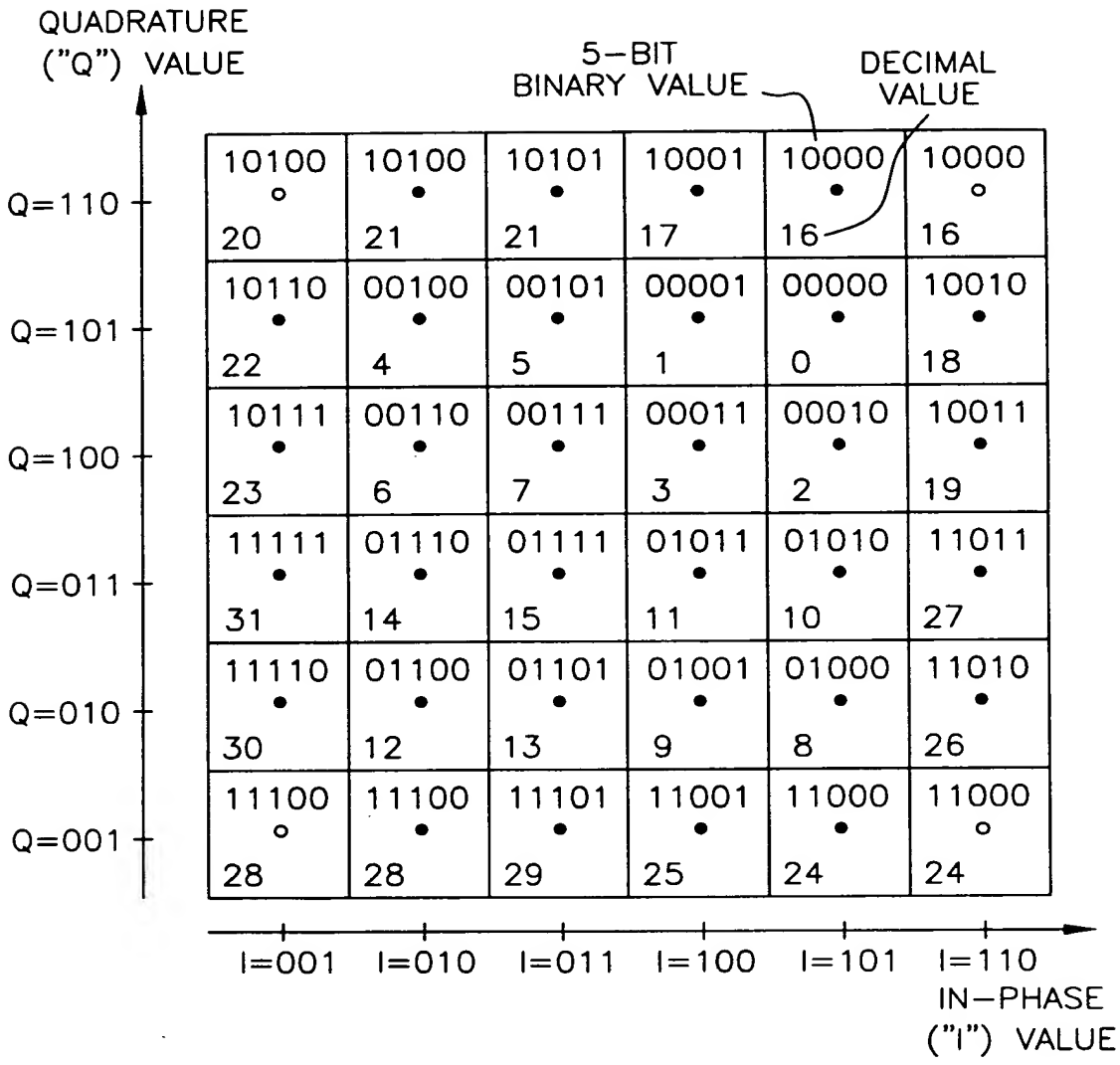

QUADRATURE
("Q") VALUE
5-BIT
BINARY VALUE
DECIMAL
VALUE
Q=110
Q=101
Q=100
Q=011
Q=010
Q=001
10100 20
10100 21
10101 21
10001 17
10000 16
10000 16
10110 22
00100 4
00101 5
00001 1
00000 0
10010 18
10111 23
00110 6
00111 7
00011 3
00010 2
10011 19
11111 31
01110 14
01111 15
01011 11
01010 10
11011 27
11110 30
01100 12
01101 13
01001 9
01000 8
11010 26
11100 28
11100 28
11101 29
11001 25
11000 24
11000 24
I=001
I=010
I=011
I=100
I=101
I=110
IN-PHASE
("I") VALUE

FIG. 17

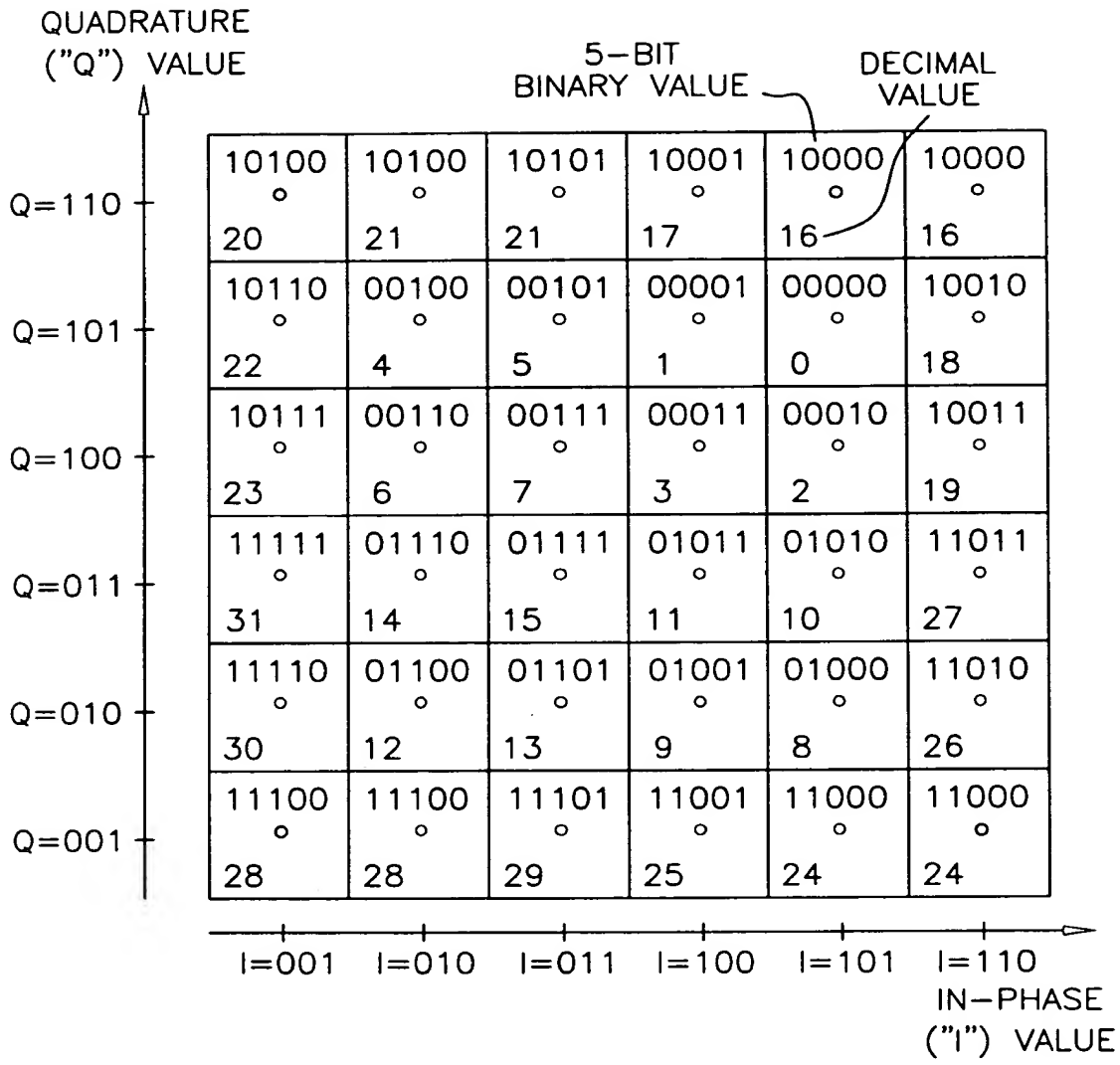

QUADRATURE ("Q") VALUE
5-BIT BINARY VALUE
DECIMAL VALUE
Q=110
Q=101
Q=100
Q=011
Q=010
Q=001
10100 20
10100 21
10101 21
10001 17
10000 16
10000 16
10110 22
00100 4
00101 5
00001 1
00000 0
10010 18
10111 23
00110 6
00111 7
00011 3
00010 2
10011 19
11111 31
01110 14
01111 15
01011 11
01010 10
11011 27
11110 30
01100 12
01101 13
01001 9
01000 8
11010 26
11100 28
11100 28
11101 29
11001 25
11000 24
11000 24
I=001
I=010
I=011
I=100
I=101
I=110
IN-PHASE ("I") VALUE

FIG. 18

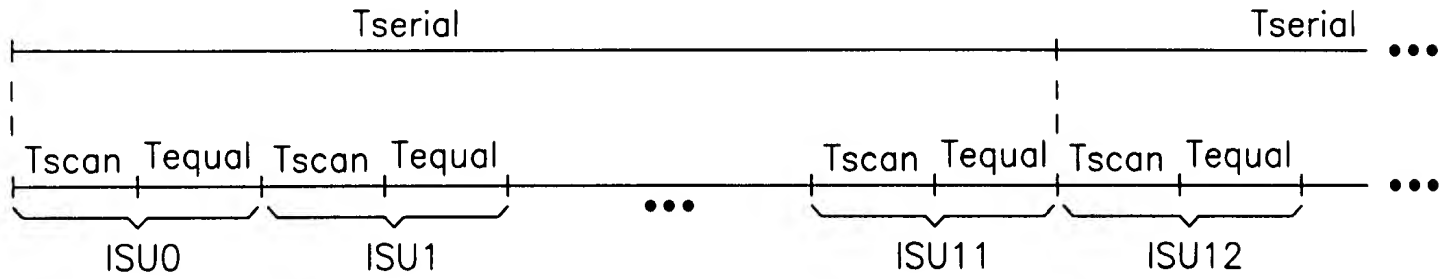

Tserial
Tserial
Tscan
Tequal
Tscan
Tequal
Tscan
Tequal
Tscan
Tequal
ISU0
ISU1
ISU11
ISU12

FIG. 19

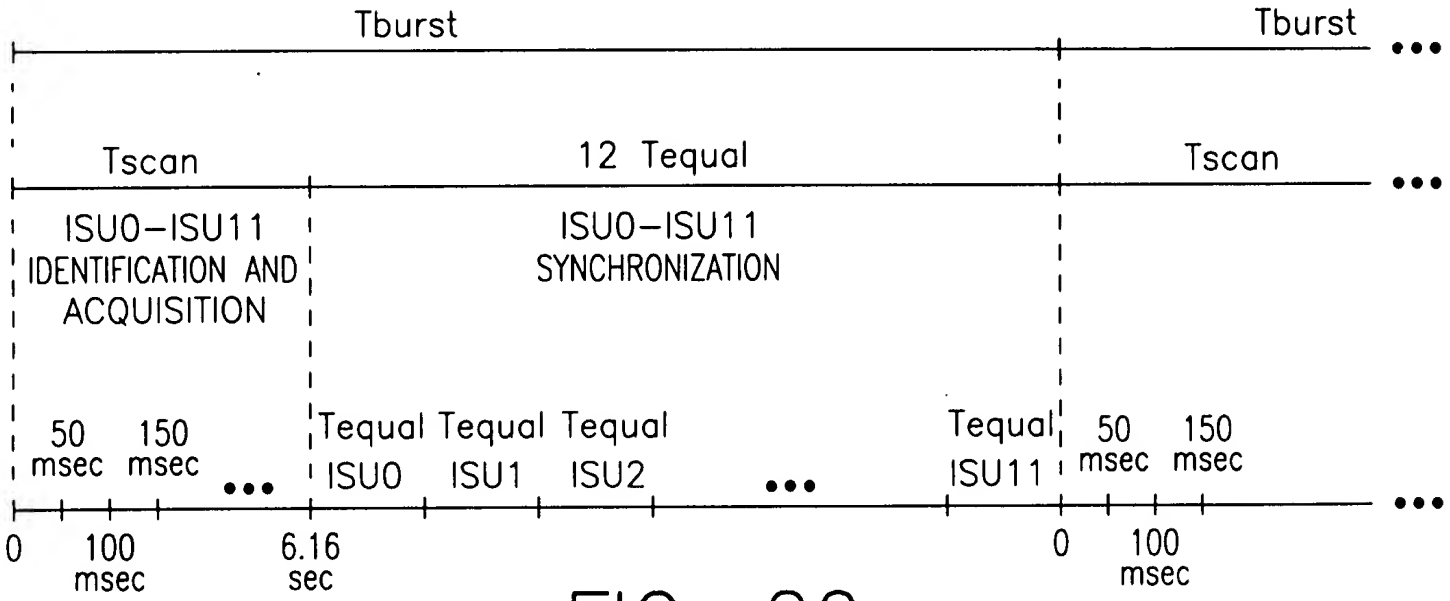

Tburst
Tburst
Tscan
12 Tequal
Tscan
ISU0–ISU11
IDENTIFICATION AND
ACQUISITION
ISU0–ISU11
SYNCHRONIZATION
50
msec
150
msec
Tequal
ISU0
Tequal
ISU1
Tequal
ISU2
Tequal
ISU11
50
msec
150
msec
0
100
msec
6.16
sec
0
100
msec

FIG. 20

T06020 "nZETO660

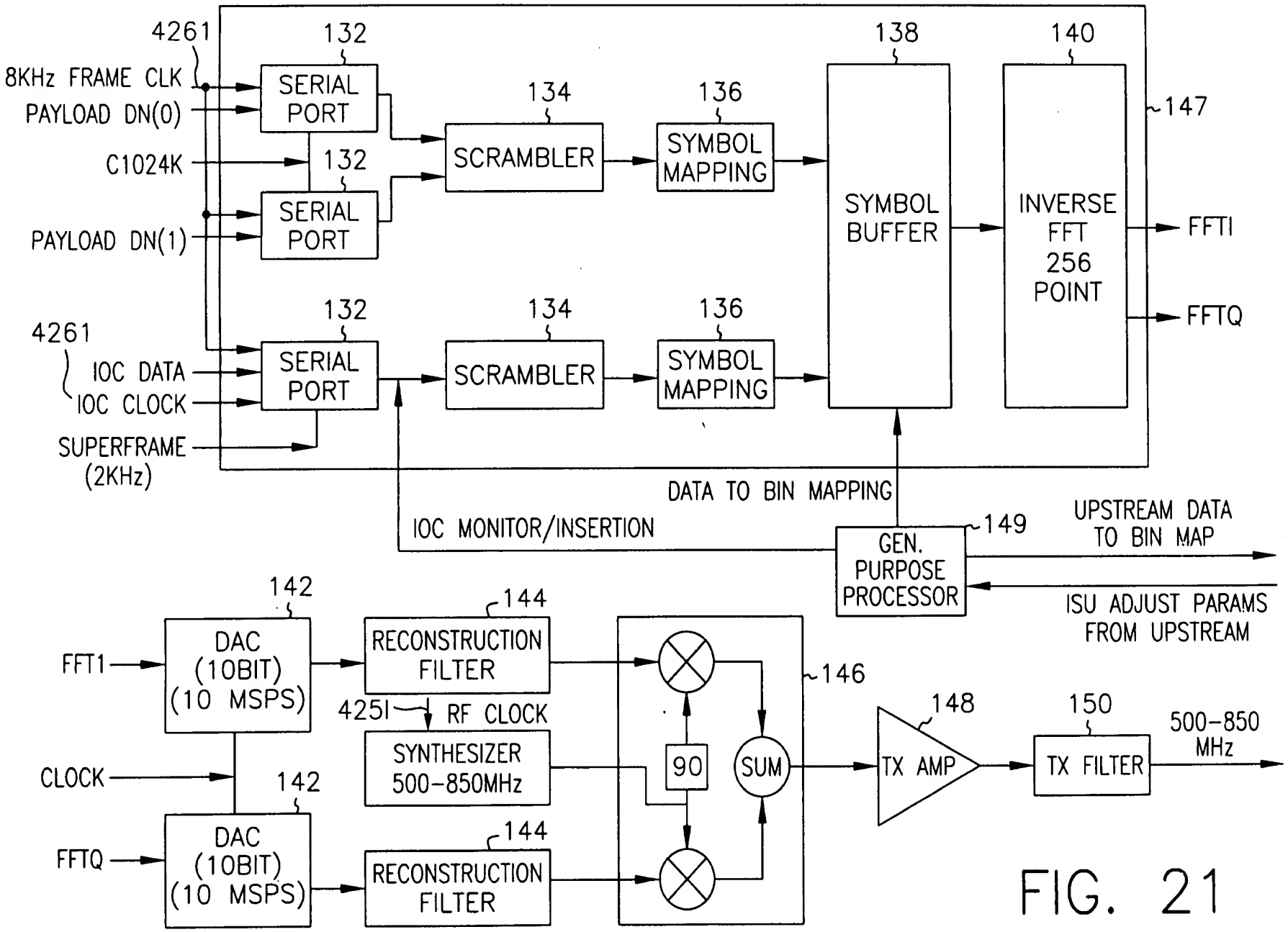


FIG. 21

T06020 "h2ET0660

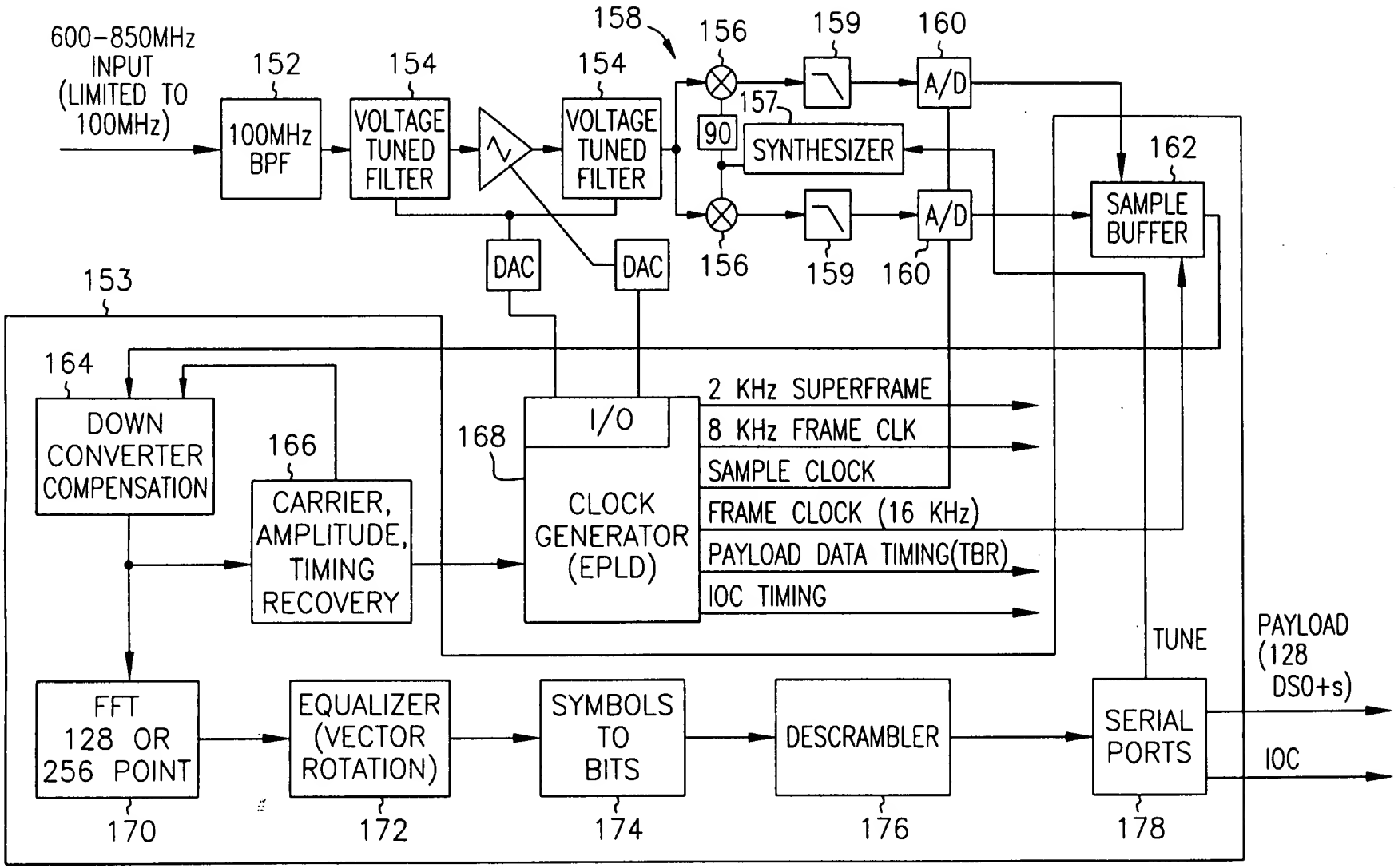


FIG. 22

T06020"h2E70660

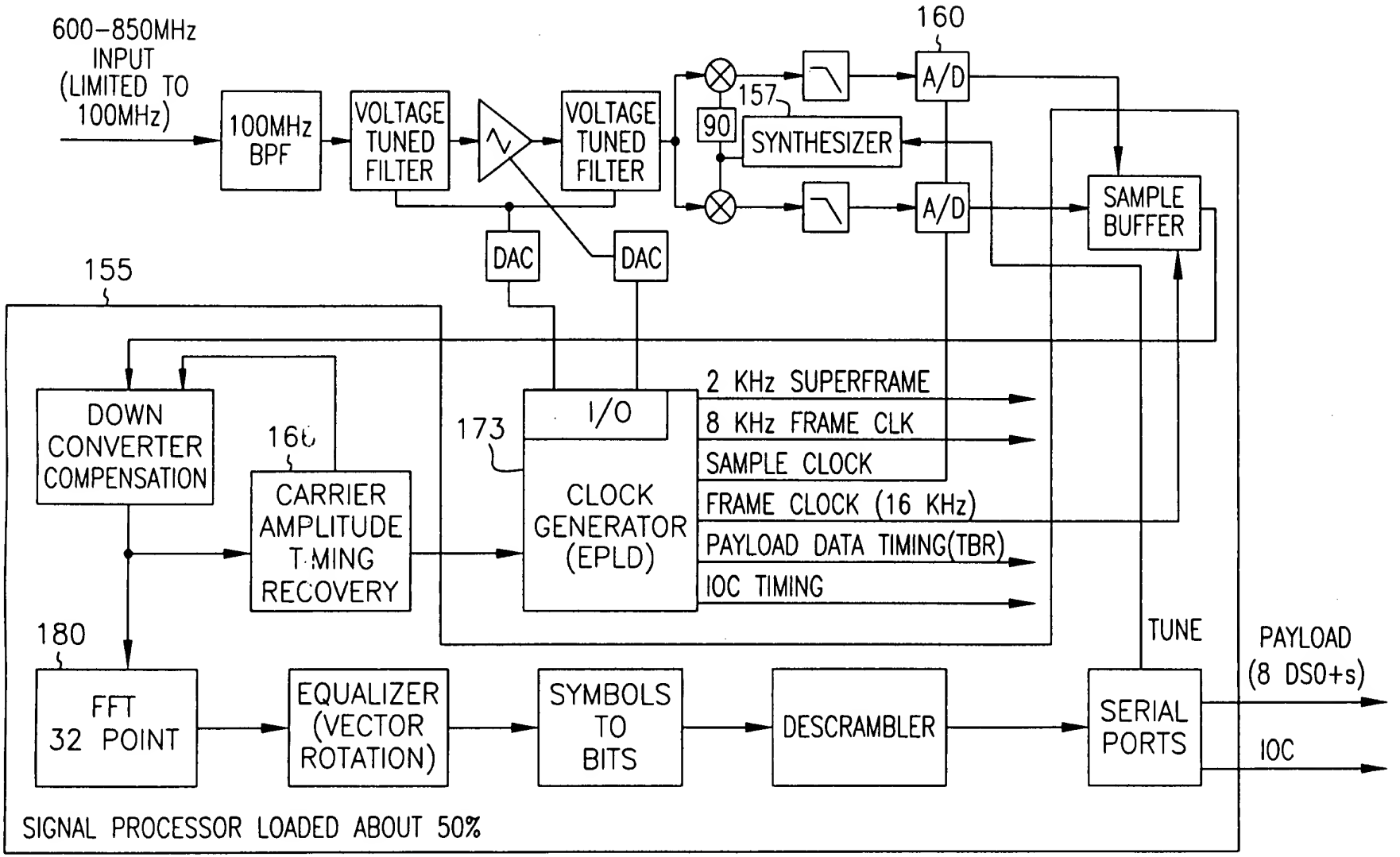


FIG. 23

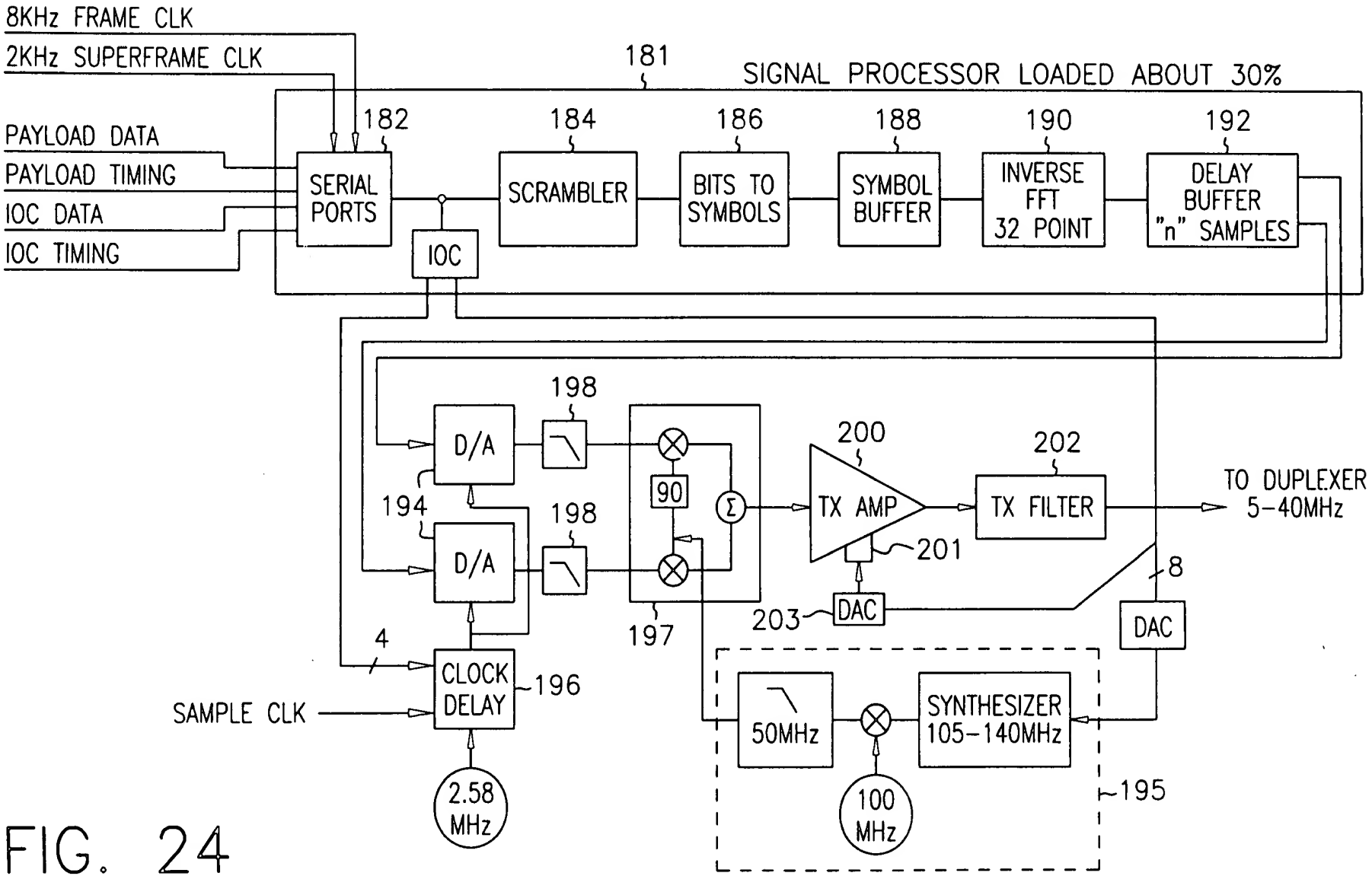

8KHz FRAME CLK
2KHz SUPERFRAME CLK
181
SIGNAL PROCESSOR LOADED ABOUT 30%
PAYLOAD DATA
PAYLOAD TIMING
IOC DATA
IOC TIMING
182
SERIAL PORTS
IOC
184
SCRAMBLER
186
BITS TO SYMBOLS
188
SYMBOL BUFFER
190
INVERSE FFT 32 POINT
192
DELAY BUFFER "n" SAMPLES
198
D/A
194
D/A
198
90
Σ
200
TX AMP
202
TX FILTER
TO DUPLEXER 5-40MHz
201
8
203
DAC
DAC
197
4
CLOCK DELAY
196
SAMPLE CLK
2.58 MHz
50MHz
SYNTHESIZER 105-140MHz
100 MHz
195

FIG. 24

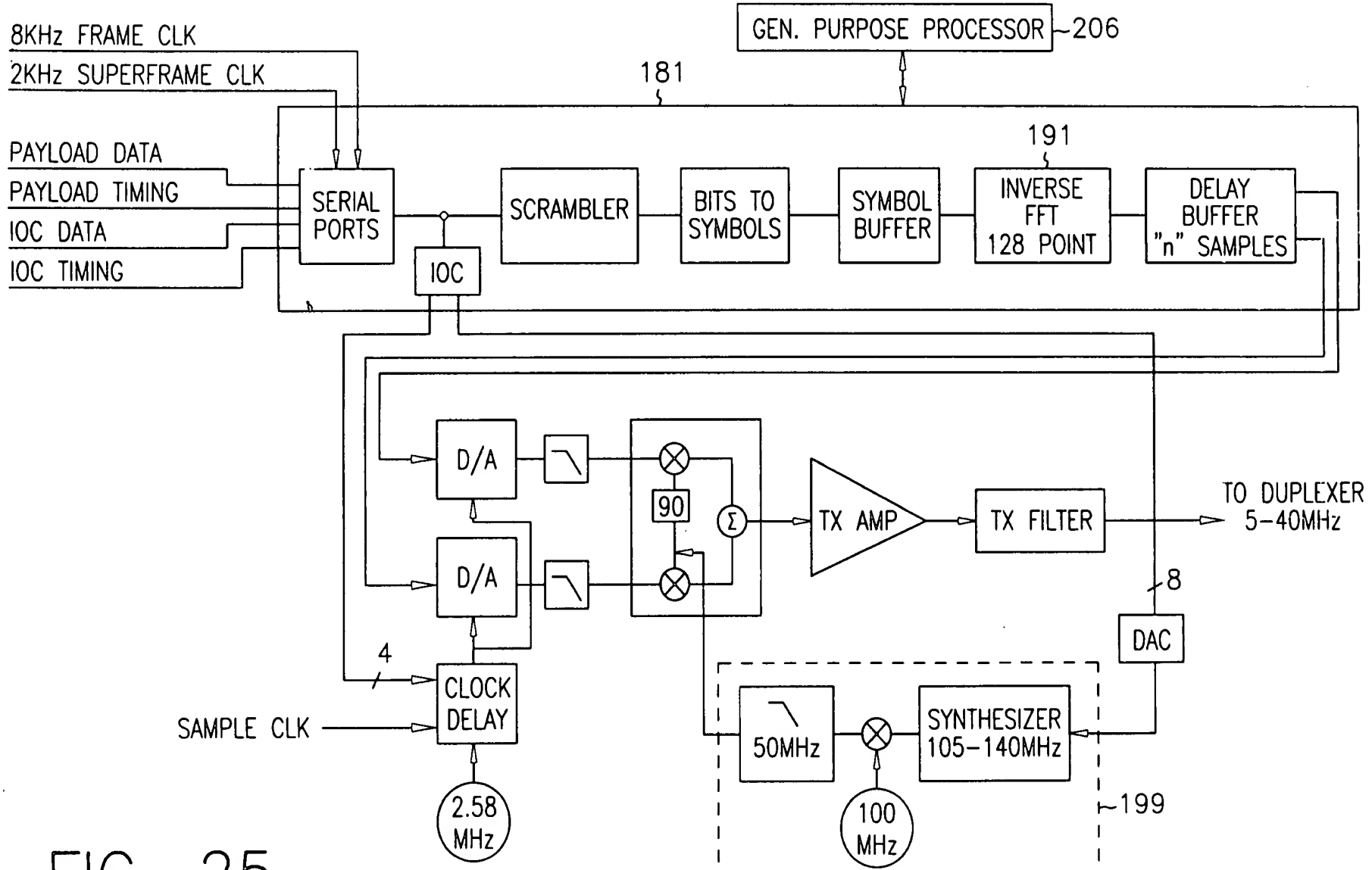

8KHz FRAME CLK
2KHz SUPERFRAME CLK
PAYLOAD DATA
PAYLOAD TIMING
IOC DATA
IOC TIMING
GEN. PURPOSE PROCESSOR
206
181
191
SERIAL PORTS
IOC
SCRAMBLER
BITS TO SYMBOLS
SYMBOL BUFFER
INVERSE FFT 128 POINT
DELAY BUFFER "n" SAMPLES
D/A
D/A
90
Σ
TX AMP
TX FILTER
TO DUPLEXER 5-40MHz
8
DAC
4
CLOCK DELAY
SAMPLE CLK
2.58 MHz
50MHz
100 MHz
SYNTHESIZER 105-140MHz
199

FIG. 25

T06620"h2ET0660

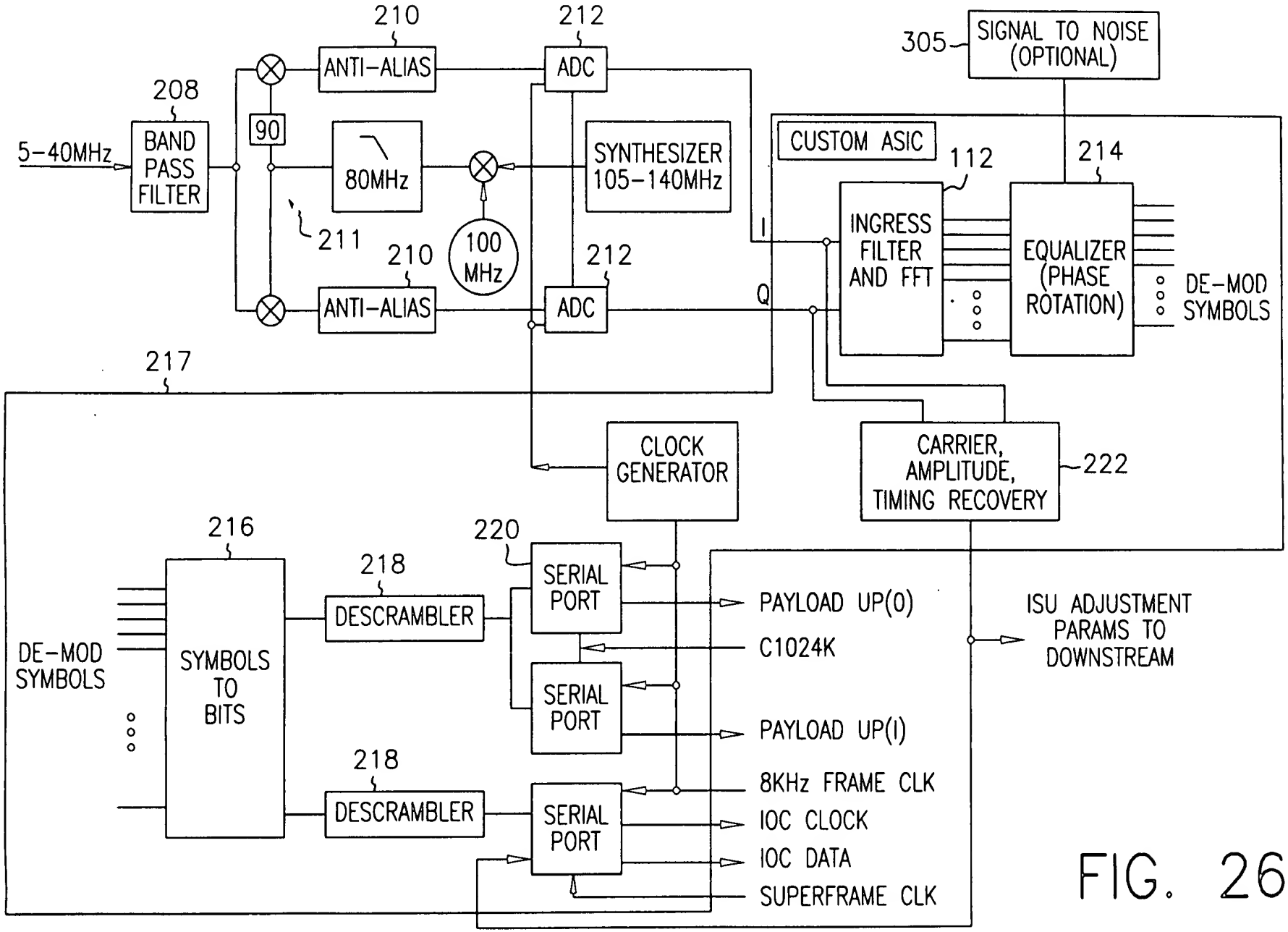


FIG. 26

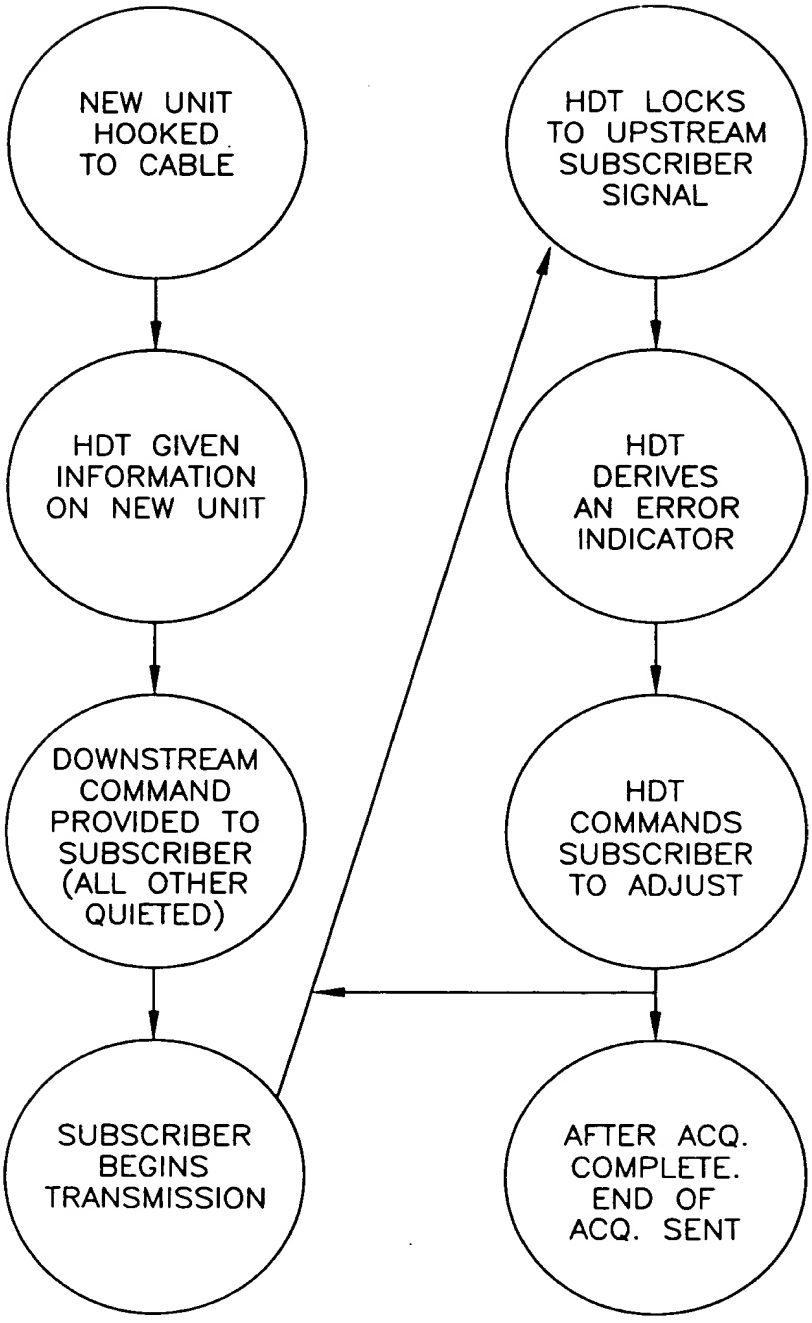

NEW UNIT HOOKED TO CABLE
HDT GIVEN INFORMATION ON NEW UNIT
DOWNSTREAM COMMAND PROVIDED TO SUBSCRIBER (ALL OTHER QUIETED)
SUBSCRIBER BEGINS TRANSMISSION
HDT LOCKS TO UPSTREAM SUBSCRIBER SIGNAL
HDT DERIVES AN ERROR INDICATOR
HDT COMMANDS SUBSCRIBER TO ADJUST
AFTER ACQ. COMPLETE. END OF ACQ. SENT

FIG. 27

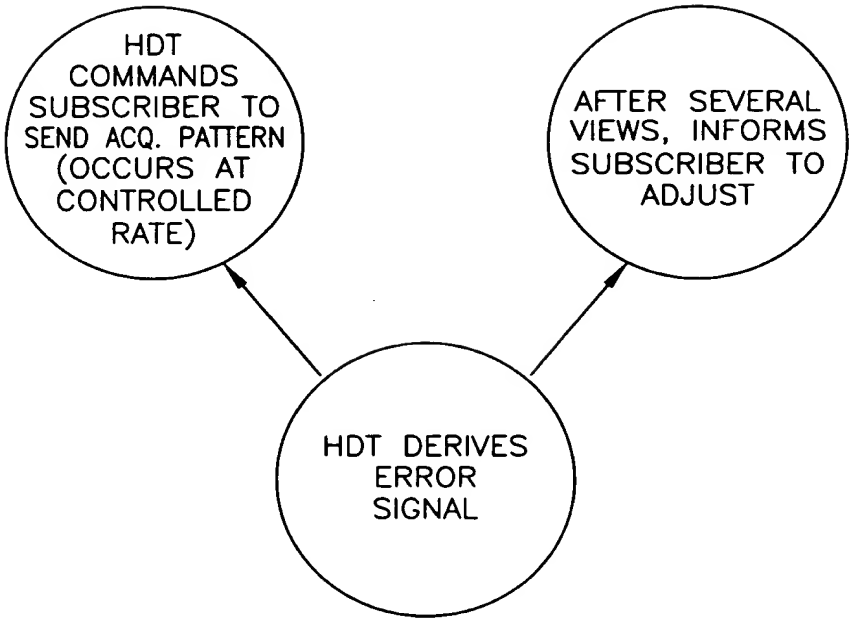

HDT COMMANDS SUBSCRIBER TO SEND ACQ. PATTERN (OCCURS AT CONTROLLED RATE)
AFTER SEVERAL VIEWS, INFORMS SUBSCRIBER TO ADJUST
HDT DERIVES ERROR SIGNAL

FIG. 28

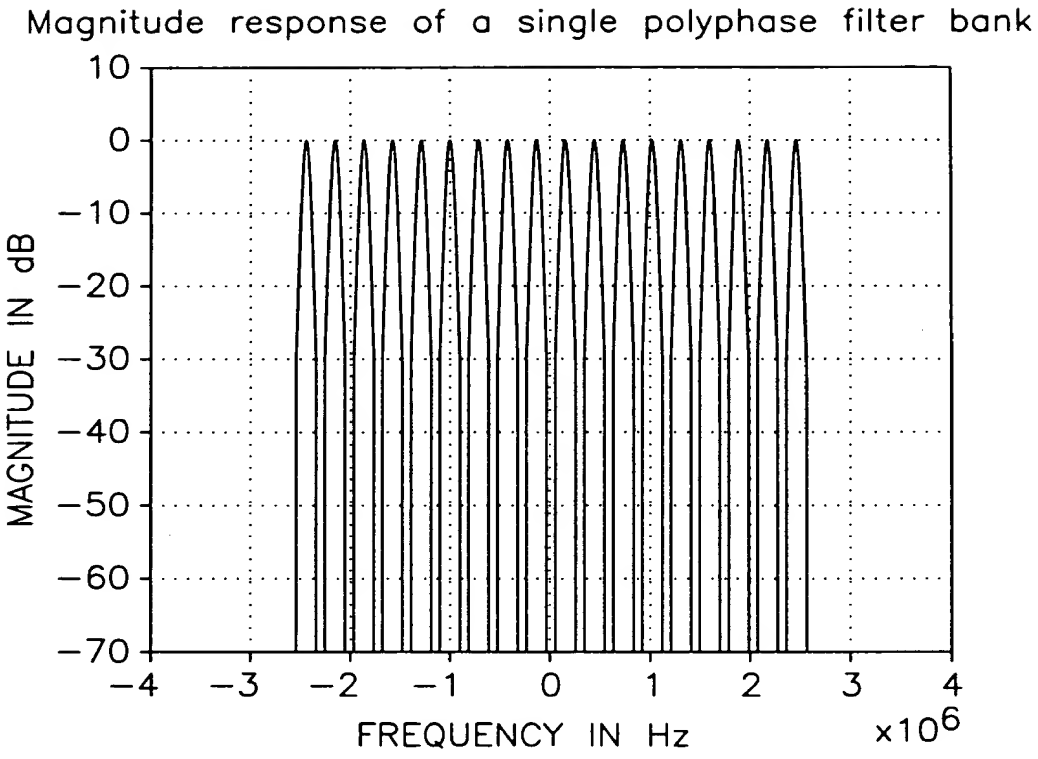

Magnitude response of a single polyphase filter bank
10
0
−10
−20
−30
−40
−50
−60
−70
MAGNITUDE IN dB
−4
−3
−2
−1
0
1
2
3
4
FREQUENCY IN Hz
x10^6

FIG. 29

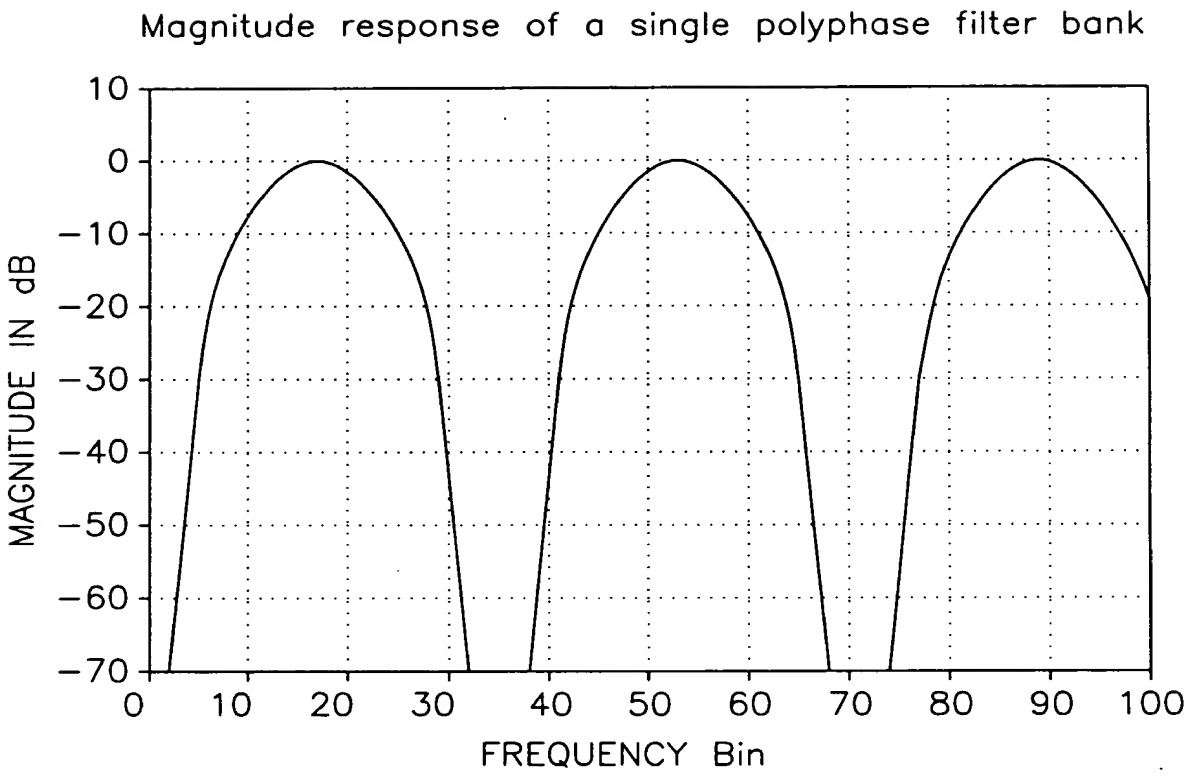

Magnitude response of a single polyphase filter bank
MAGNITUDE IN dB
10
0
−10
−20
−30
−40
−50
−60
−70
0
10
20
30
40
50
60
70
80
90
100
FREQUENCY Bin

FIG. 30

T06020 "42E70660

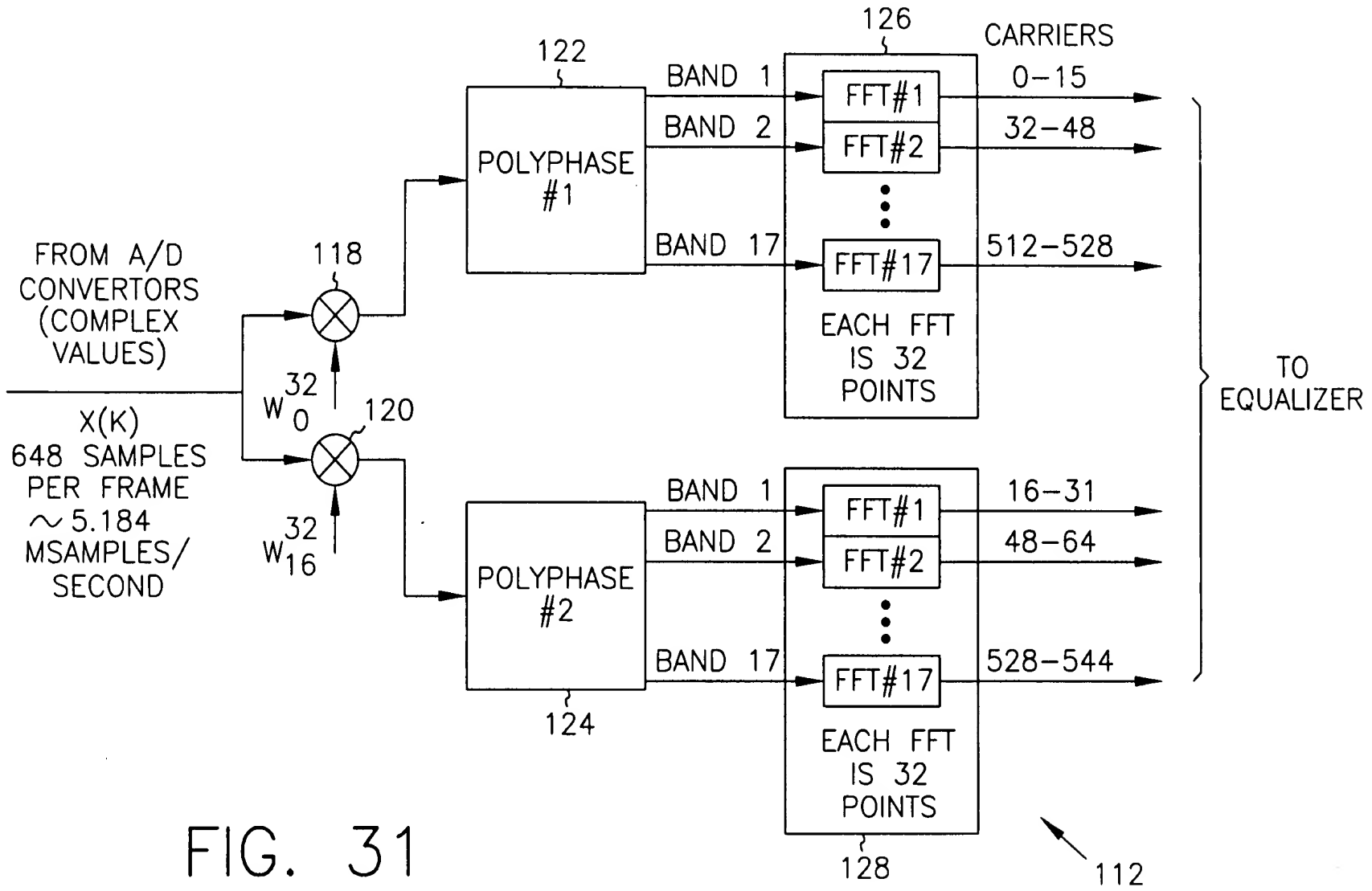


FIG. 31

T06020 "42T060

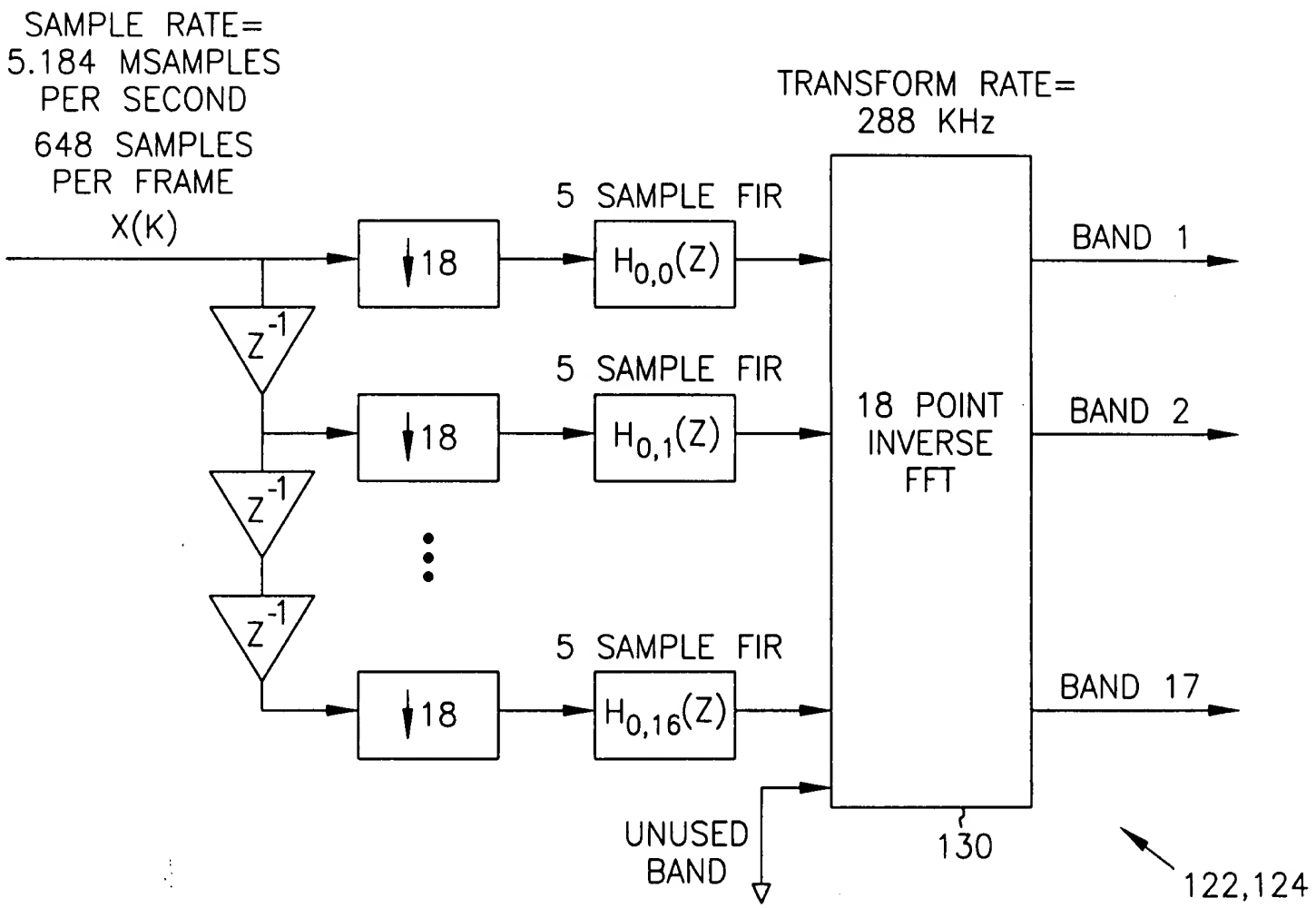
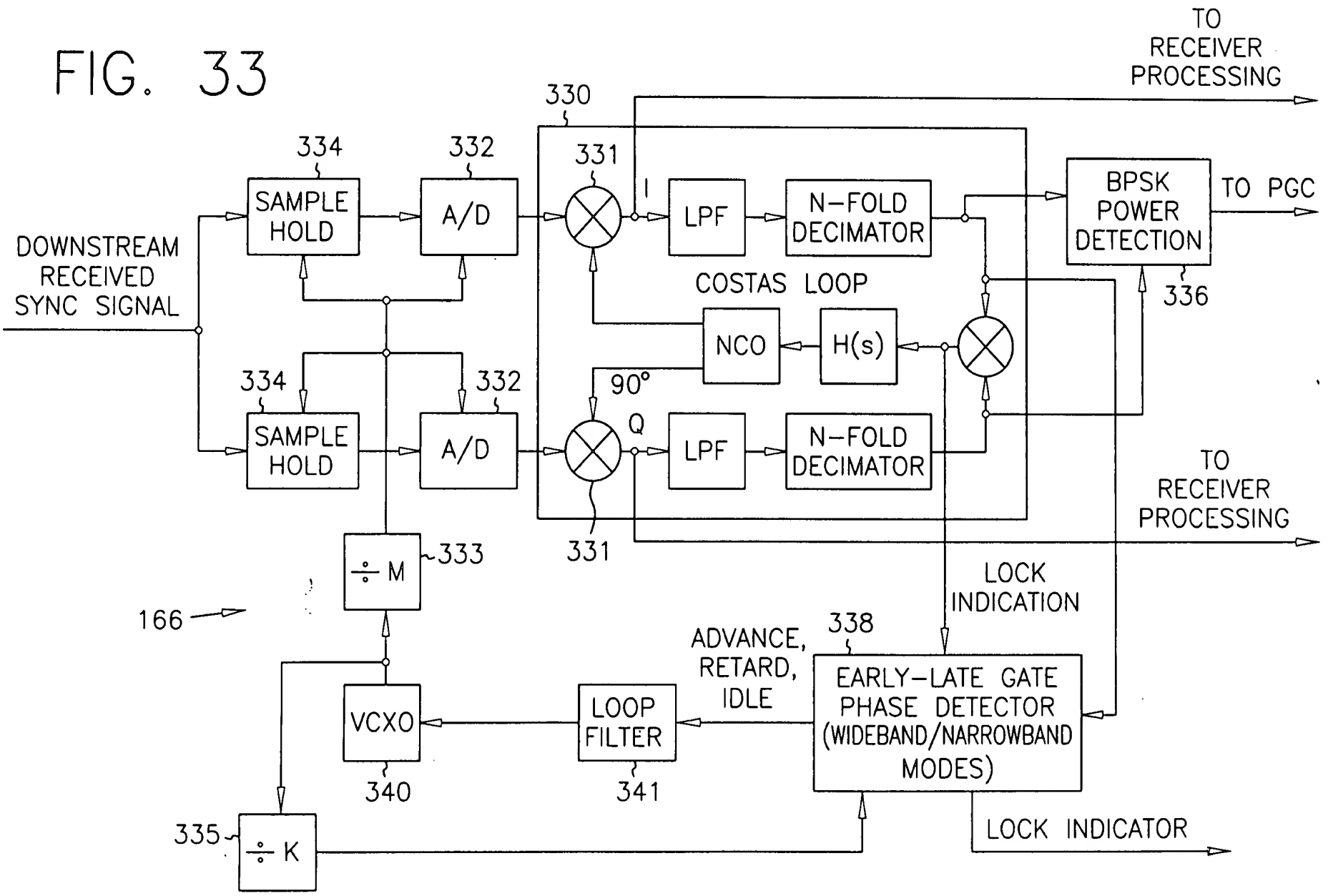


FIG. 32

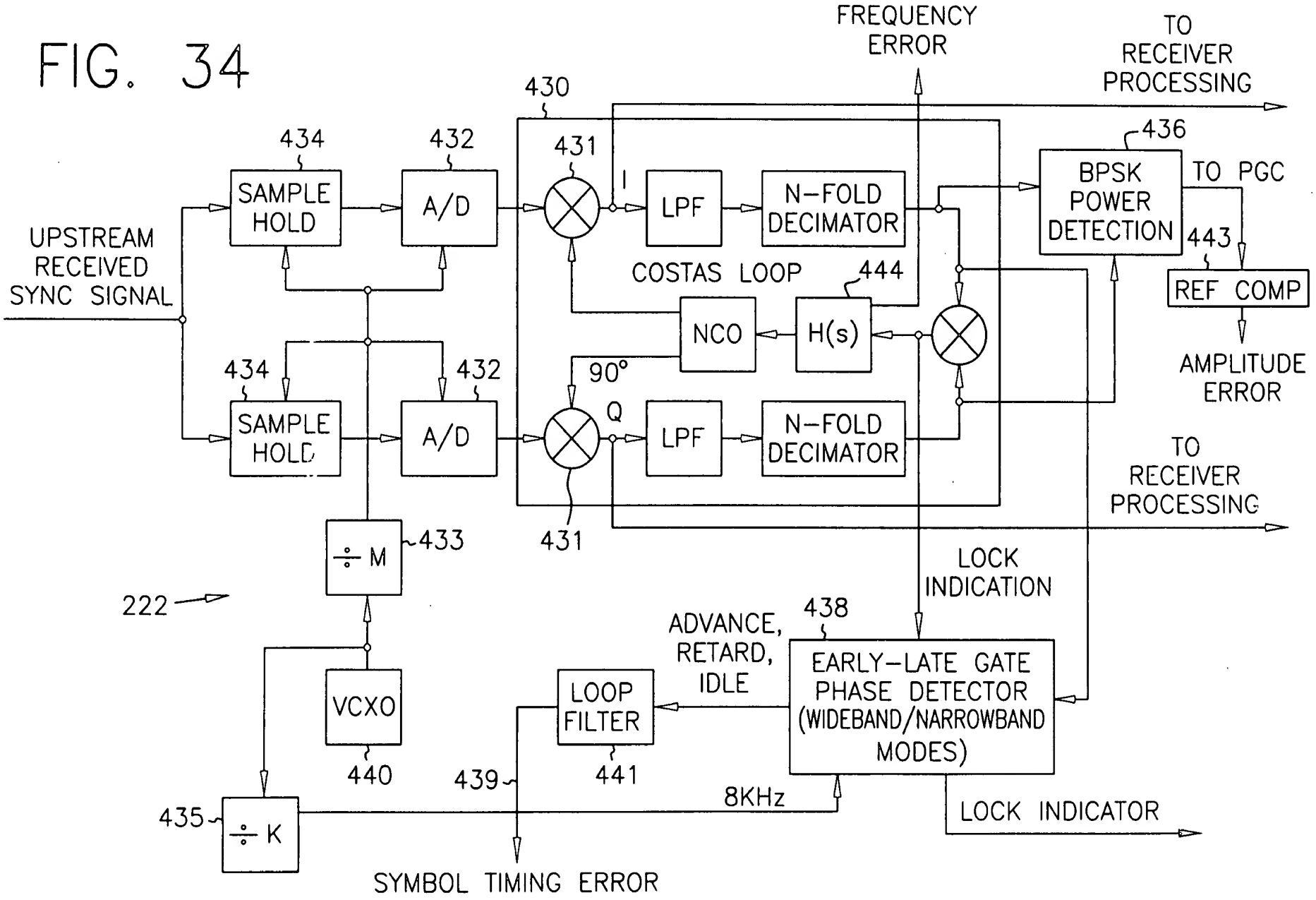
TD6620 "ZETD660

FIG. 33



T06620 "42T0660

FIG. 34



T06020 "t27T0660

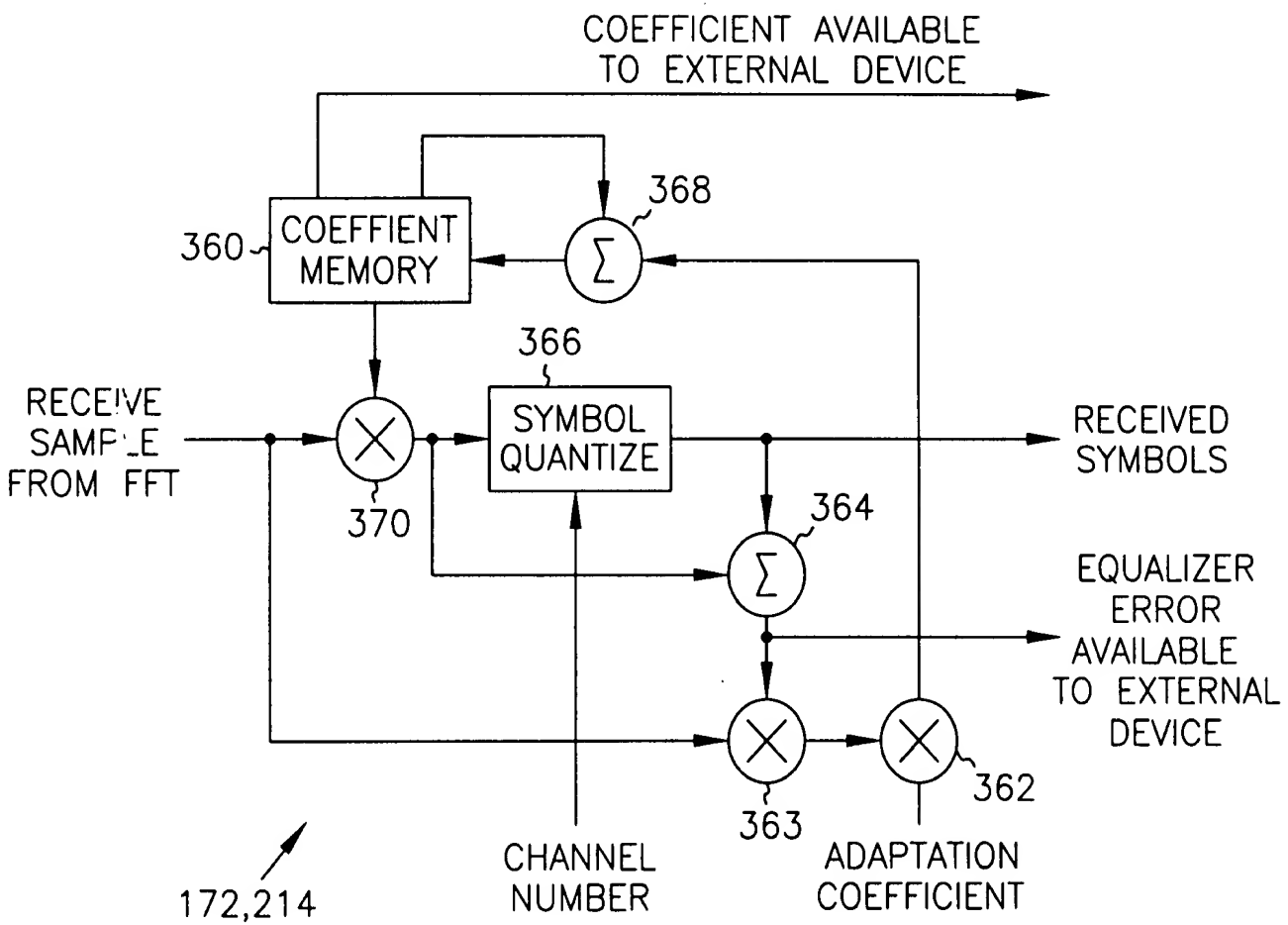


FIG. 35

T06020"h2ET0660

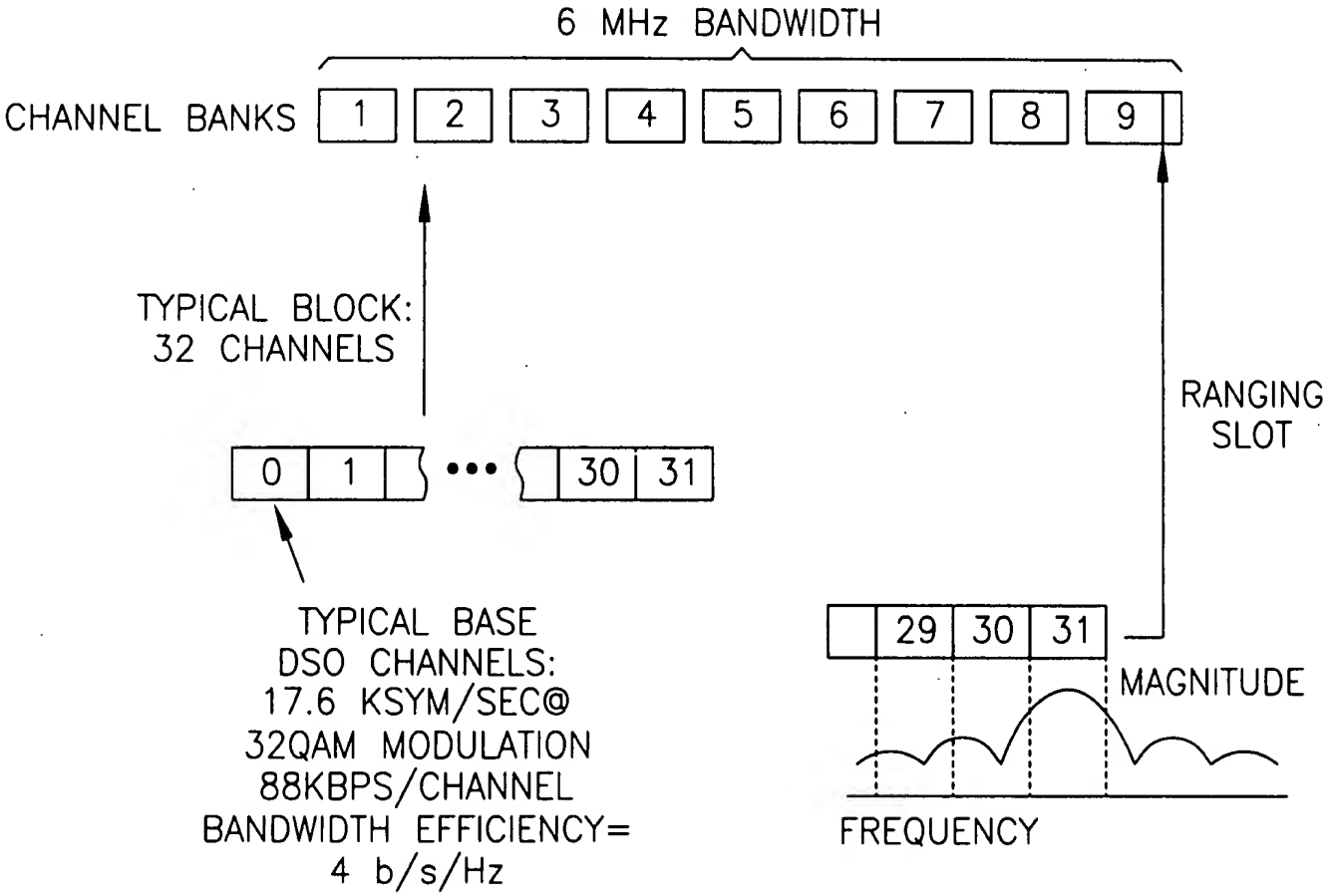


FIG. 36

T06020"42ET0660

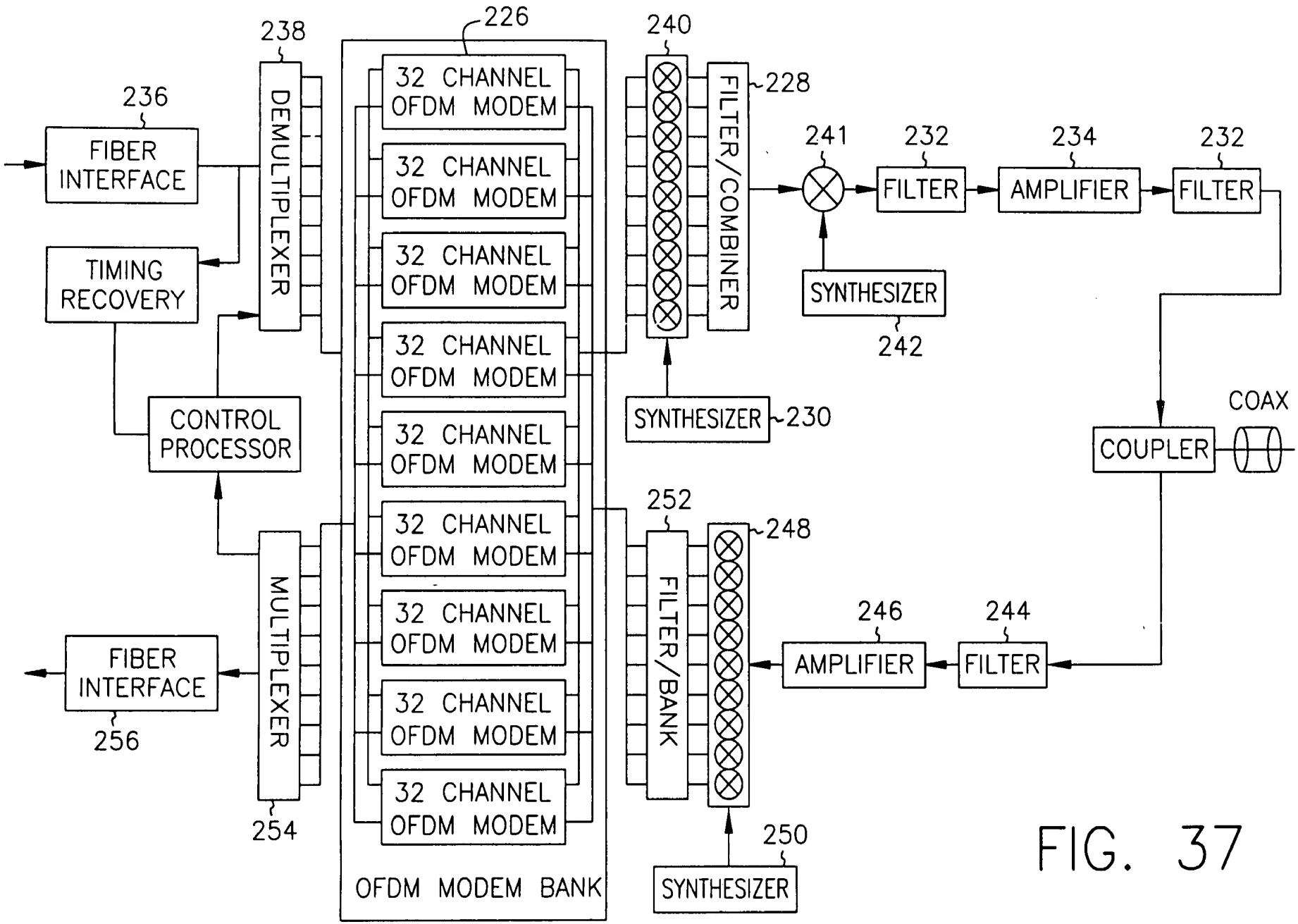


FIG. 37

T06020"h2ET060

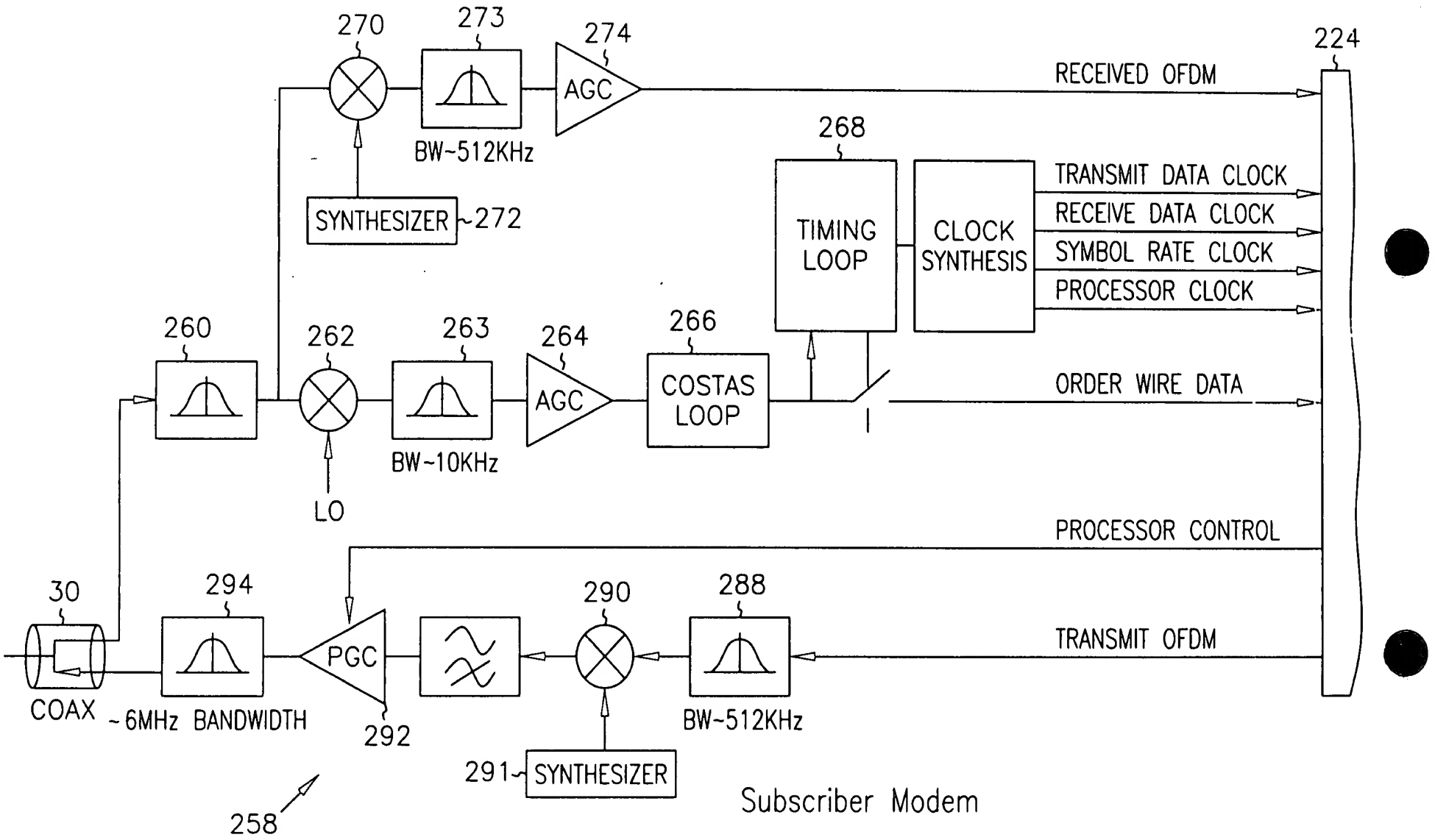


FIG. 38

T06020"h2T0660

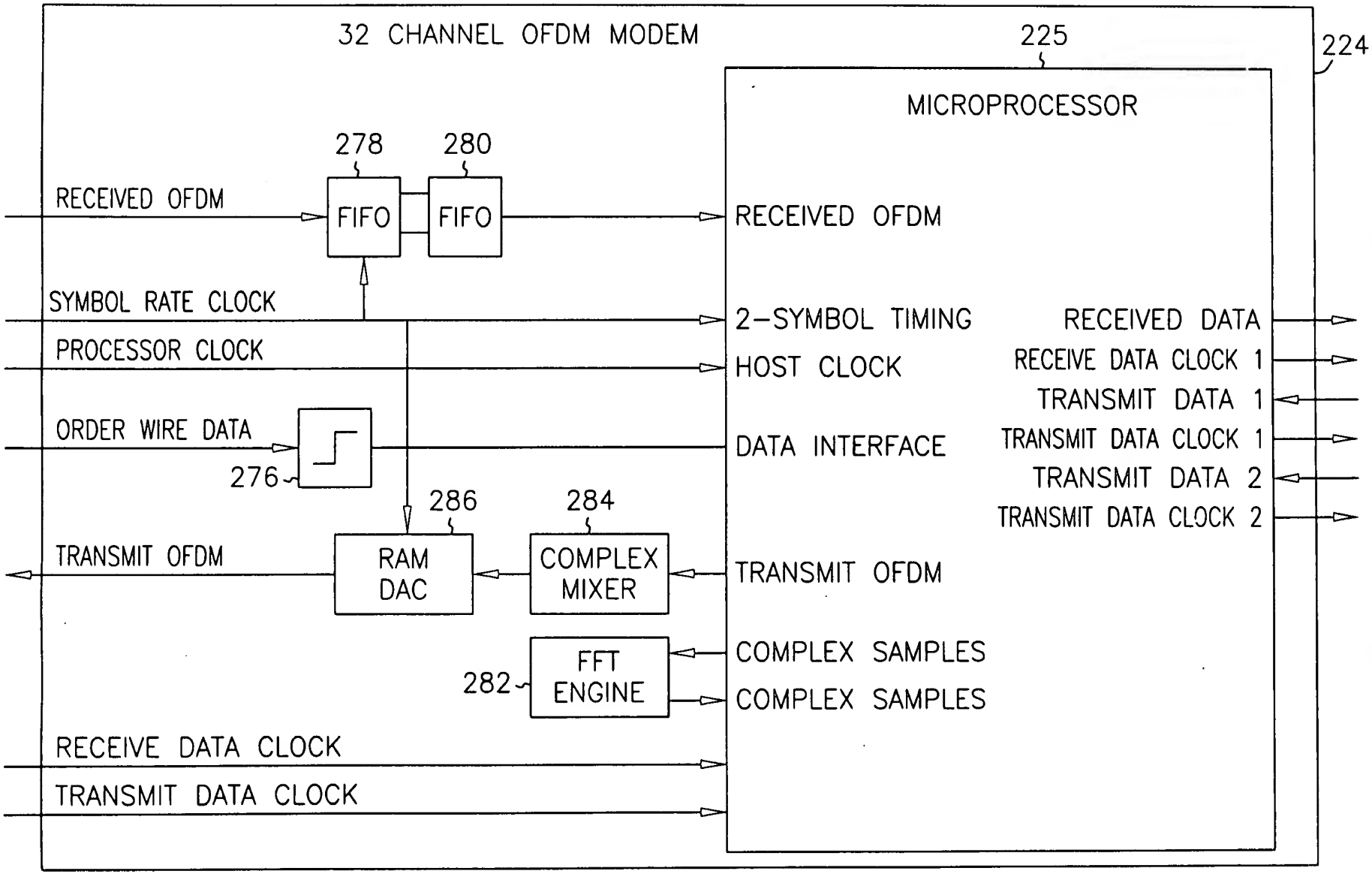


FIG. 39

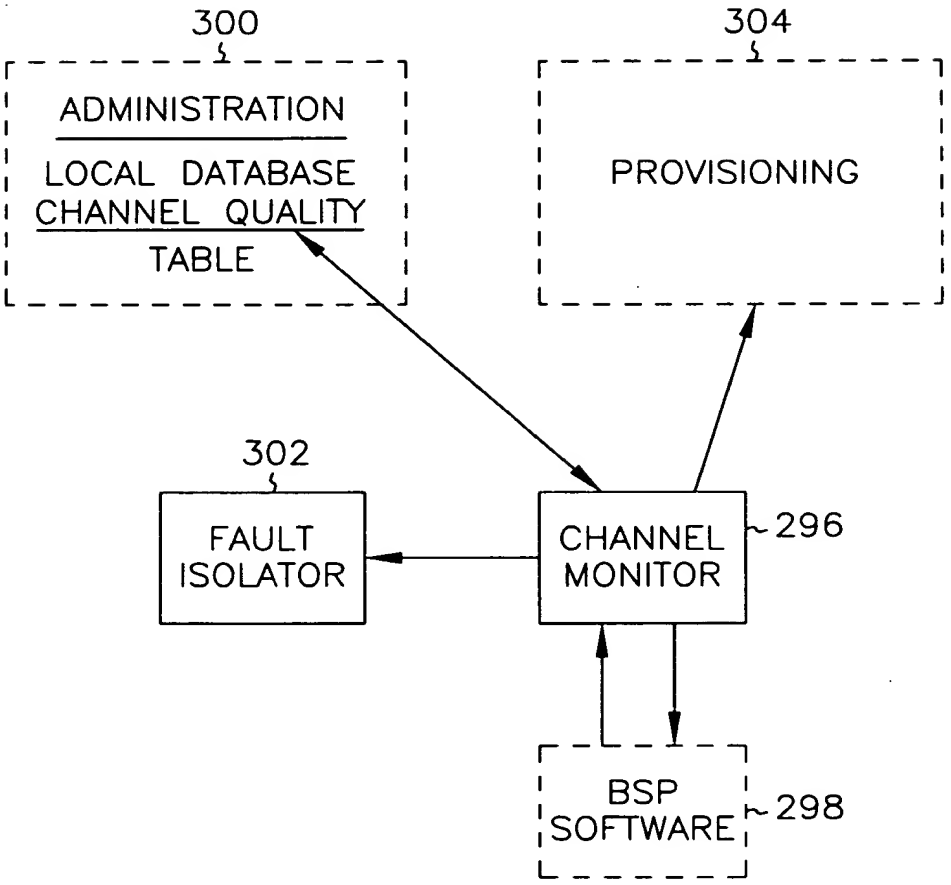

300
ADMINISTRATION
LOCAL DATABASE
CHANNEL QUALITY
TABLE
304
PROVISIONING
302
FAULT
ISOLATOR
CHANNEL
MONITOR
296
BSP
SOFTWARE
298

FIG. 40

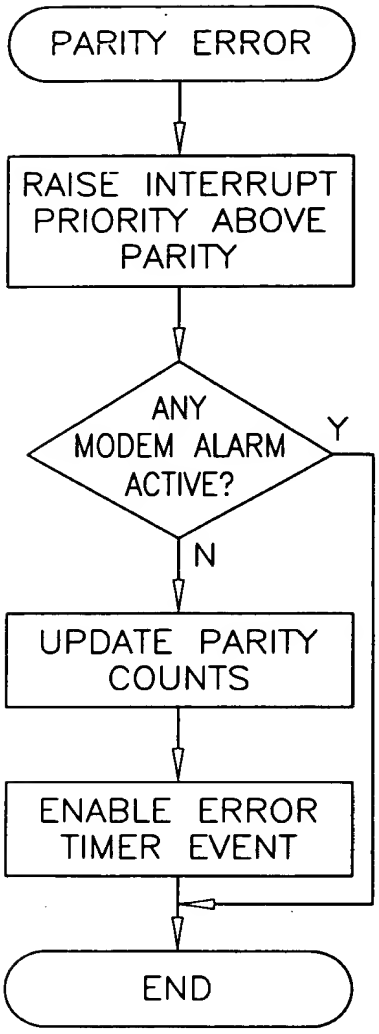


FIG. 41

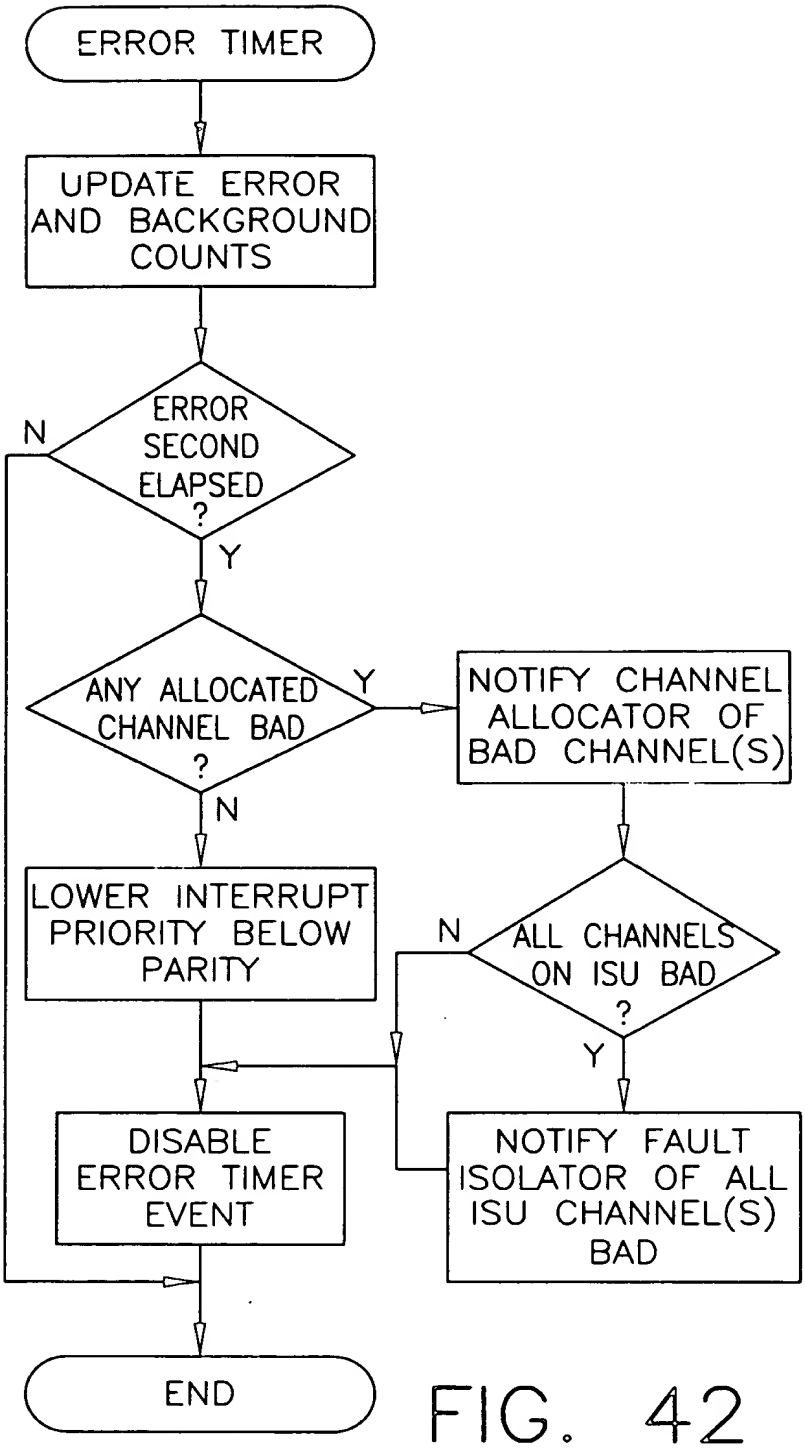


FIG. 42

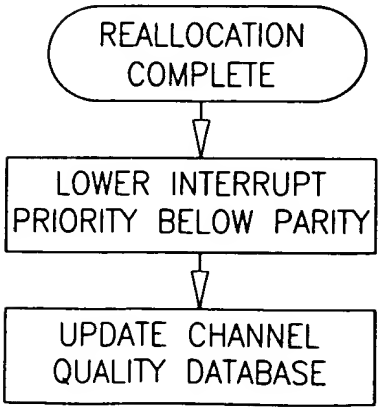
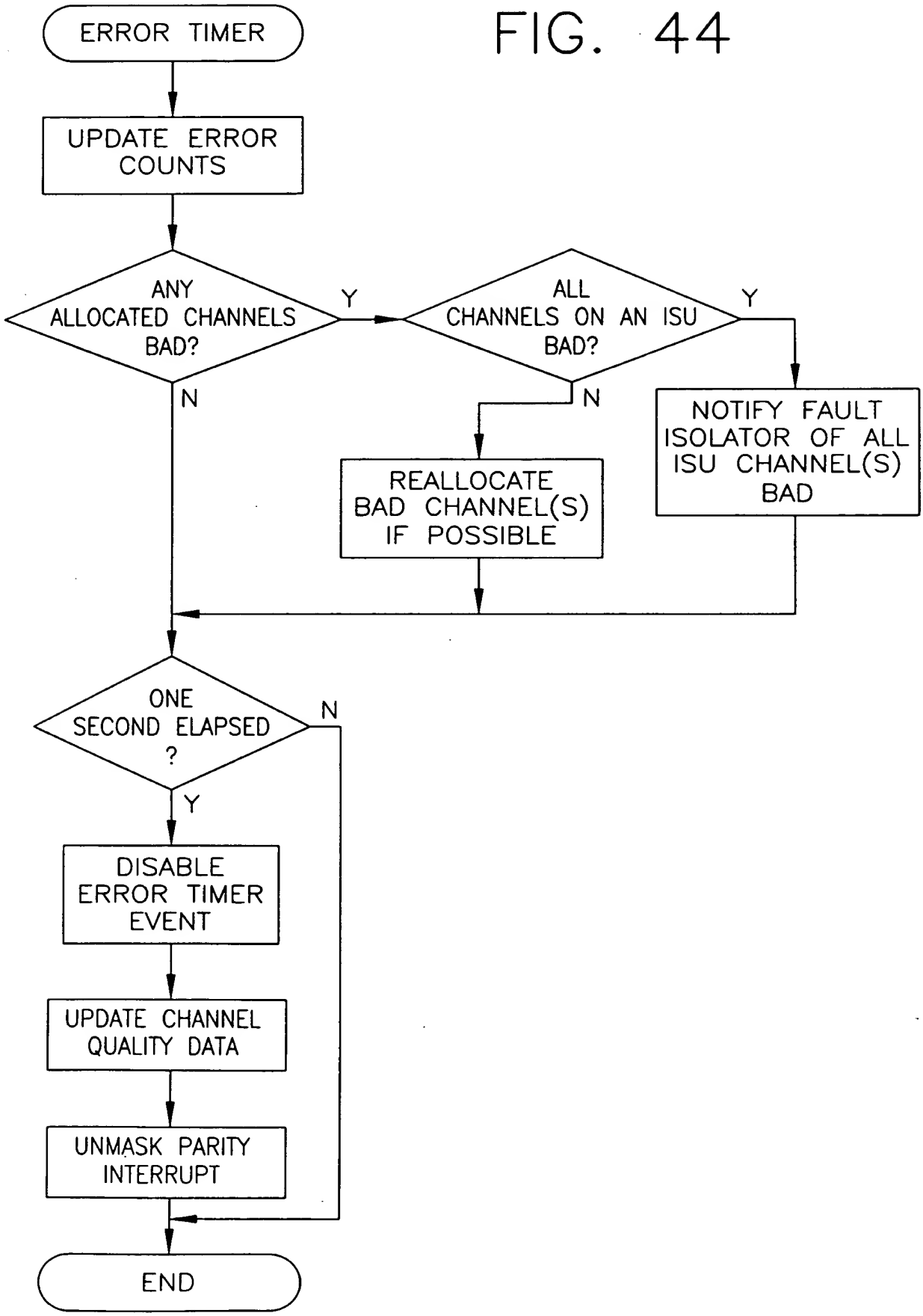


FIG. 43

FIG. 44


ERROR TIMER
UPDATE ERROR COUNTS
ANY ALLOCATED CHANNELS BAD?
Y
ALL CHANNELS ON AN ISU BAD?
Y
N
N
NOTIFY FAULT ISOLATOR OF ALL ISU CHANNEL(S) BAD
REALLOCATE BAD CHANNEL(S) IF POSSIBLE
ONE SECOND ELAPSED ?
N
Y
DISABLE ERROR TIMER EVENT
UPDATE CHANNEL QUALITY DATA
UNMASK PARITY INTERRUPT
END

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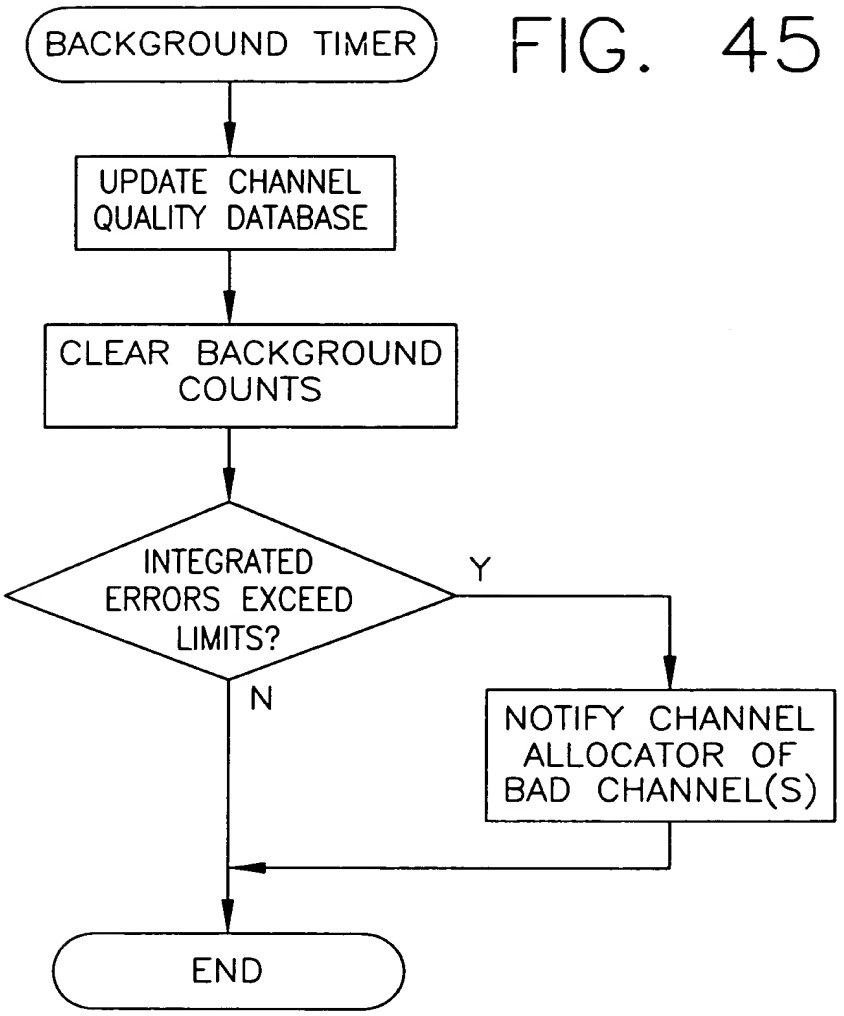

FIG. 45

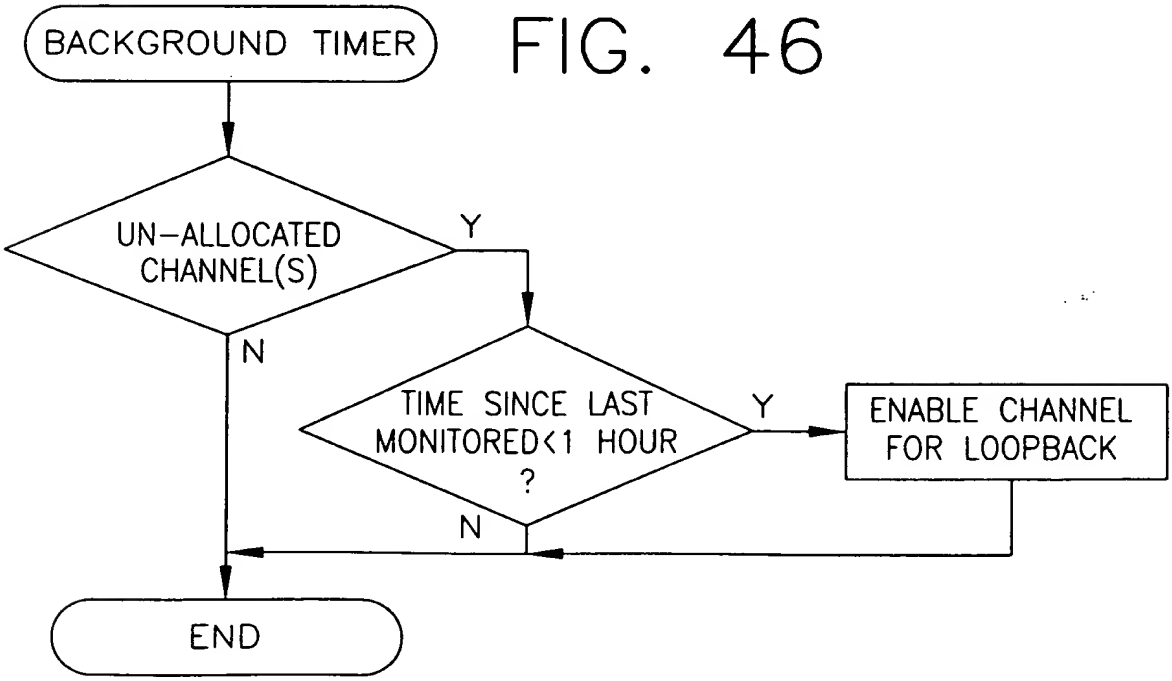

FIG. 46

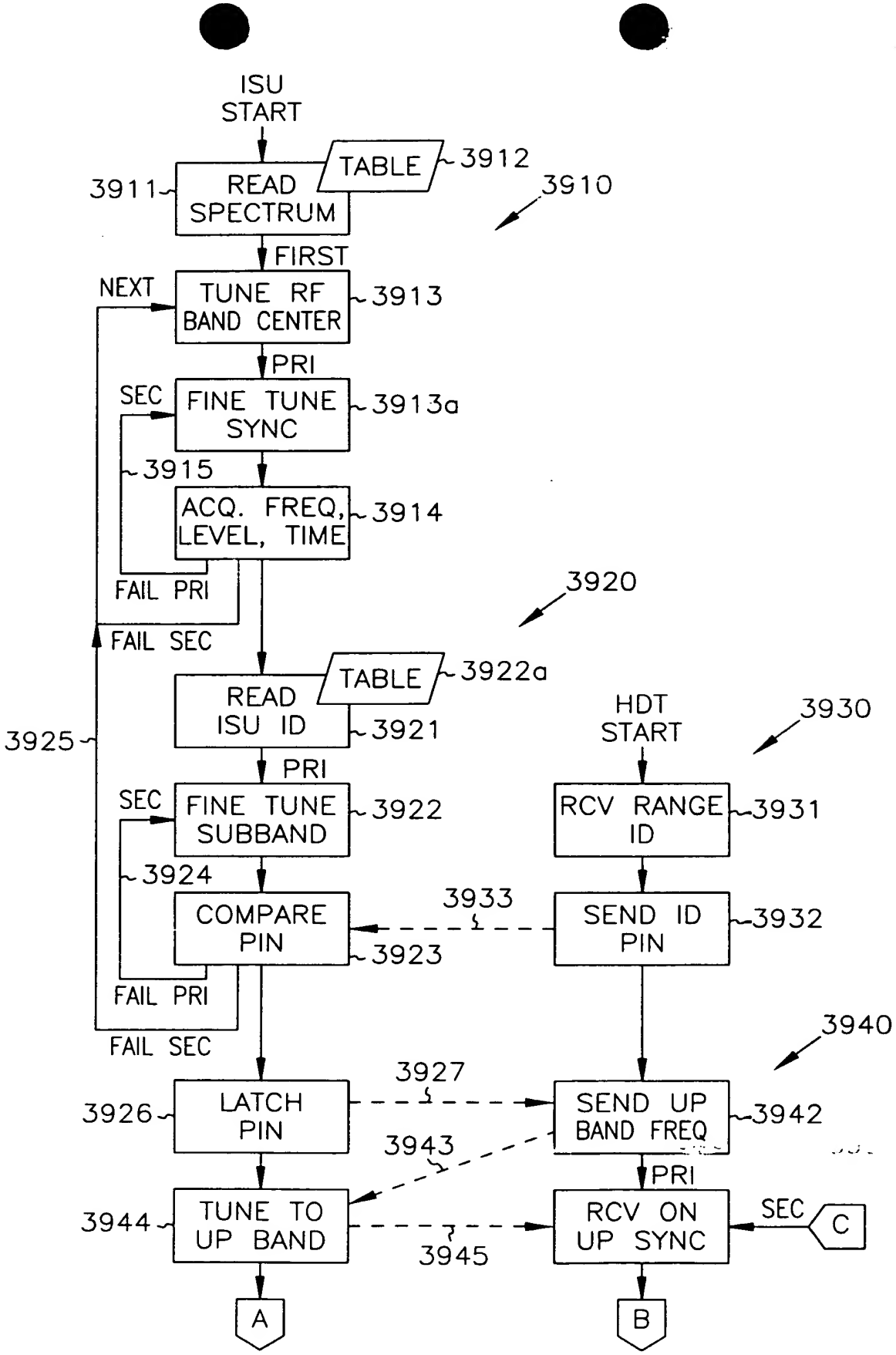
ISU START
TABLE
3912
3911
READ SPECTRUM
3910
FIRST
NEXT
TUNE RF BAND CENTER
3913
PRI
SEC
FINE TUNE SYNC
3913a
3915
ACQ. FREQ, LEVEL, TIME
3914
FAIL PRI
FAIL SEC
3920
TABLE
3922a
READ ISU ID
3921
3925
PRI
SEC
FINE TUNE SUBBAND
3922
3924
COMPARE PIN
3923
FAIL PRI
FAIL SEC
HDT START
3930
RCV RANGE ID
3931
3933
SEND ID PIN
3932
3940
3927
3926
LATCH PIN
SEND UP BAND FREQ
3942
3943
PRI
3944
TUNE TO UP BAND
3945
RCV ON UP SYNC
SEC
C
A
B

FIG. 47

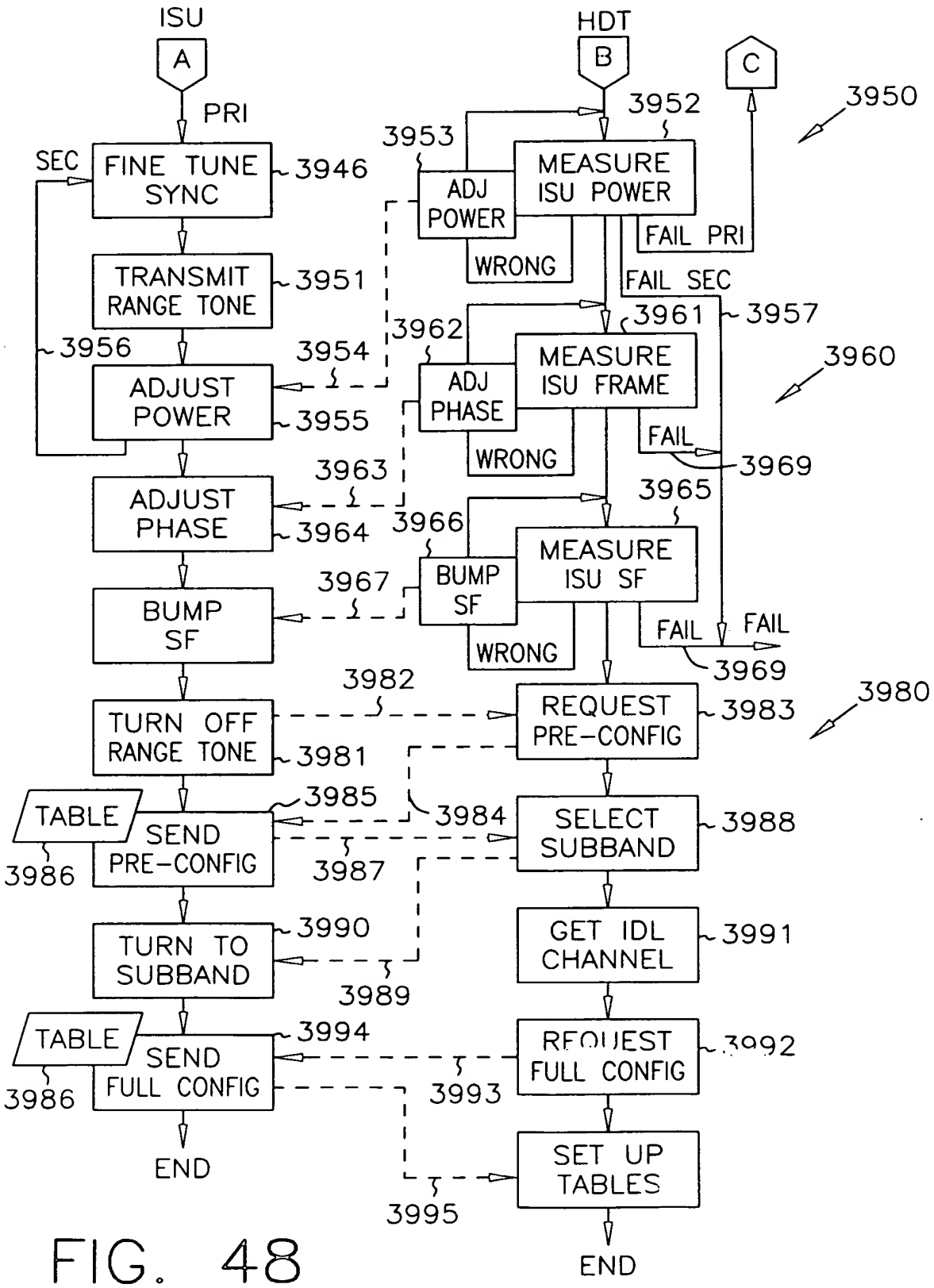
ISU
A
PRI
SEC
FINE TUNE SYNC
3946
TRANSMIT RANGE TONE
3951
3956
ADJUST POWER
3954
3955
ADJUST PHASE
3963
3964
BUMP SF
3967
TURN OFF RANGE TONE
3981
TABLE
SEND PRE-CONFIG
3985
3986
3987
TURN TO SUBBAND
3990
3989
TABLE
SEND FULL CONFIG
3994
3986
3993
END
HDT
B
C
3952
3950
3953
ADJ POWER
MEASURE ISU POWER
WRONG
FAIL PRI
FAIL SEC
3961
3957
3962
ADJ PHASE
MEASURE ISU FRAME
3960
WRONG
FAIL
3969
3965
3966
BUMP SF
MEASURE ISU SF
WRONG
FAIL
FAIL
3969
3982
REQUEST PRE-CONFIG
3983
3980
3984
SELECT SUBBAND
3988
GET IDL CHANNEL
3991
REQUEST FULL CONFIG
3992
3995
SET UP TABLES
END

FIG. 48

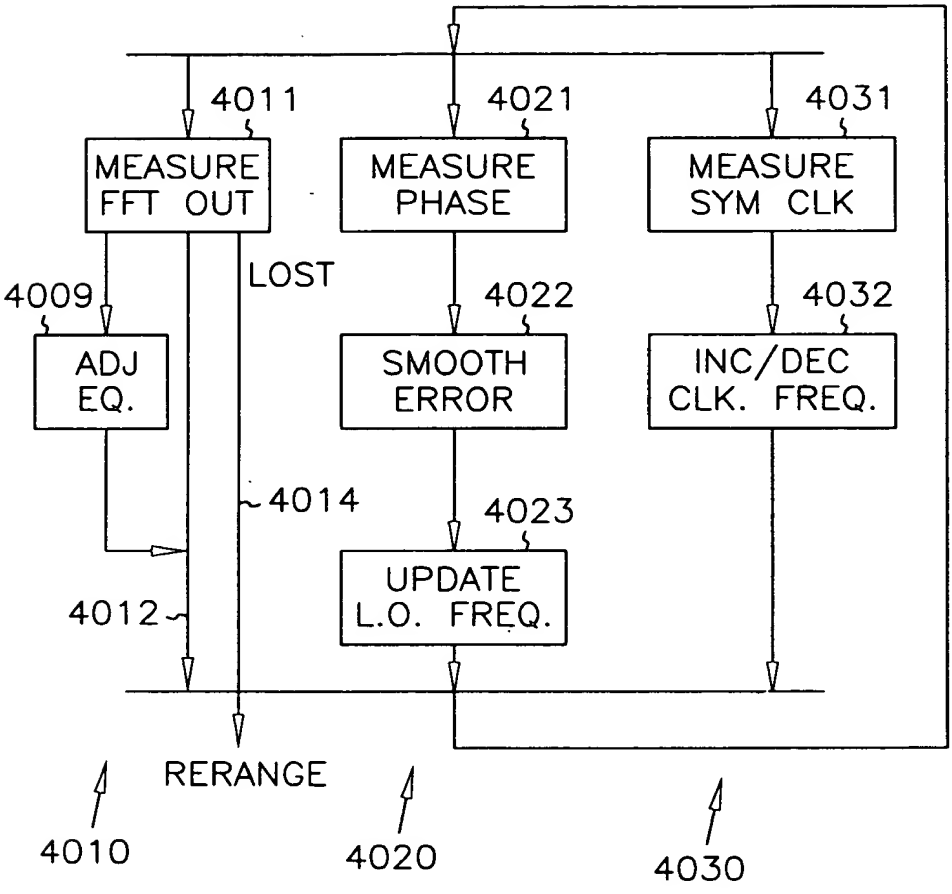
4011
4021
4031
MEASURE FFT OUT
MEASURE PHASE
MEASURE SYM CLK
LOST
4009
4022
4032
ADJ EQ.
SMOOTH ERROR
INC/DEC CLK. FREQ.
4014
4023
UPDATE L.O. FREQ.
4012
RERANGE
4010
4020
4030

FIG. 49

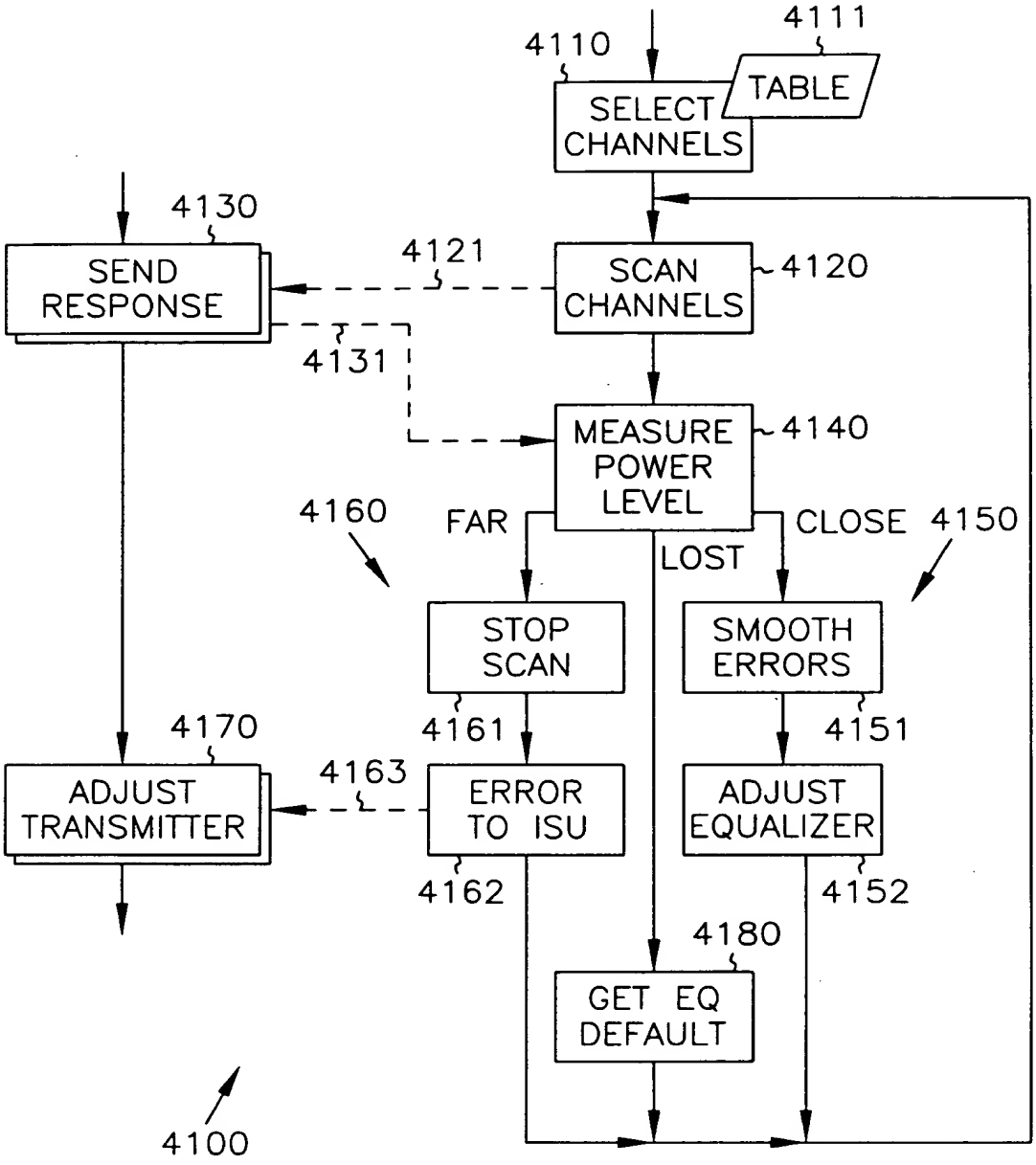
4110
4111
SELECT CHANNELS
TABLE
4130
SEND RESPONSE
4121
SCAN CHANNELS
4120
4131
MEASURE POWER LEVEL
4140
4160
FAR
CLOSE
4150
LOST
STOP SCAN
SMOOTH ERRORS
4161
4151
4170
4163
ADJUST TRANSMITTER
ERROR TO ISU
ADJUST EQUALIZER
4162
4152
4180
GET EQ DEFAULT
4100

FIG. 50

T06020"h2ET0660

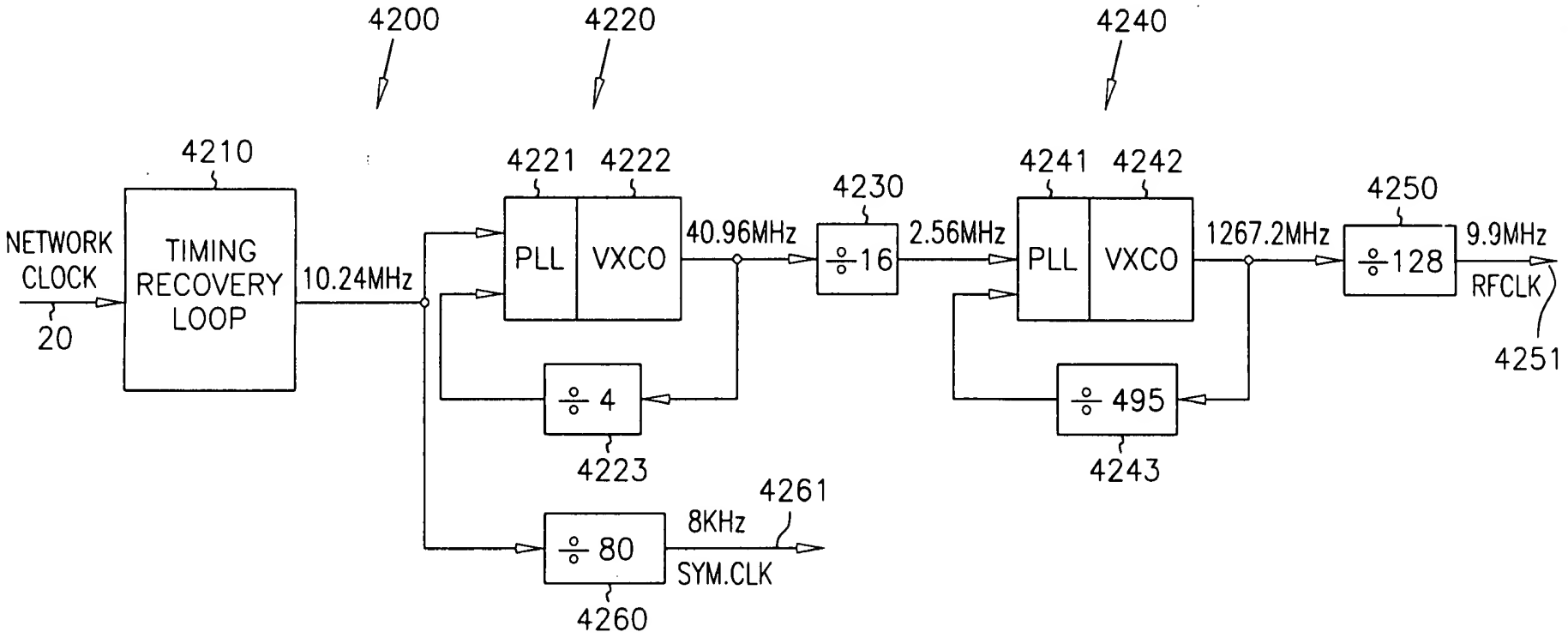

FIG. 51

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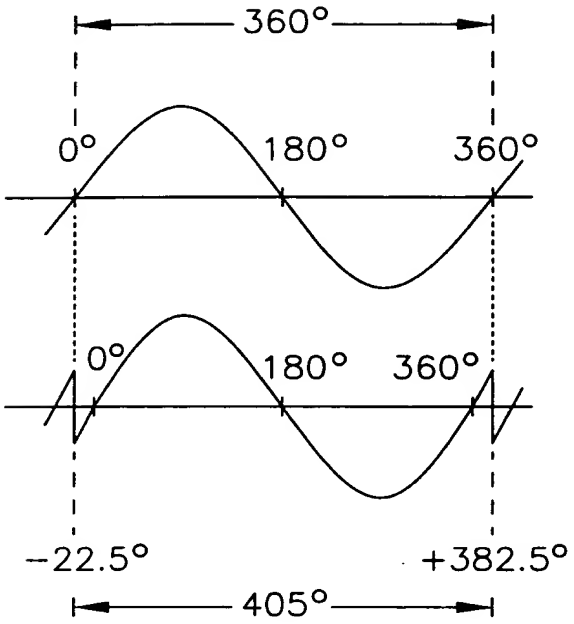

FIG. 52

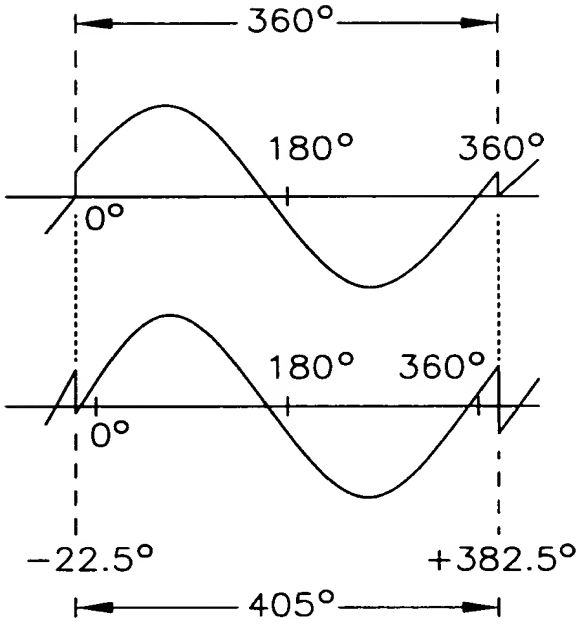

FIG. 53

T06020"h2ET0660

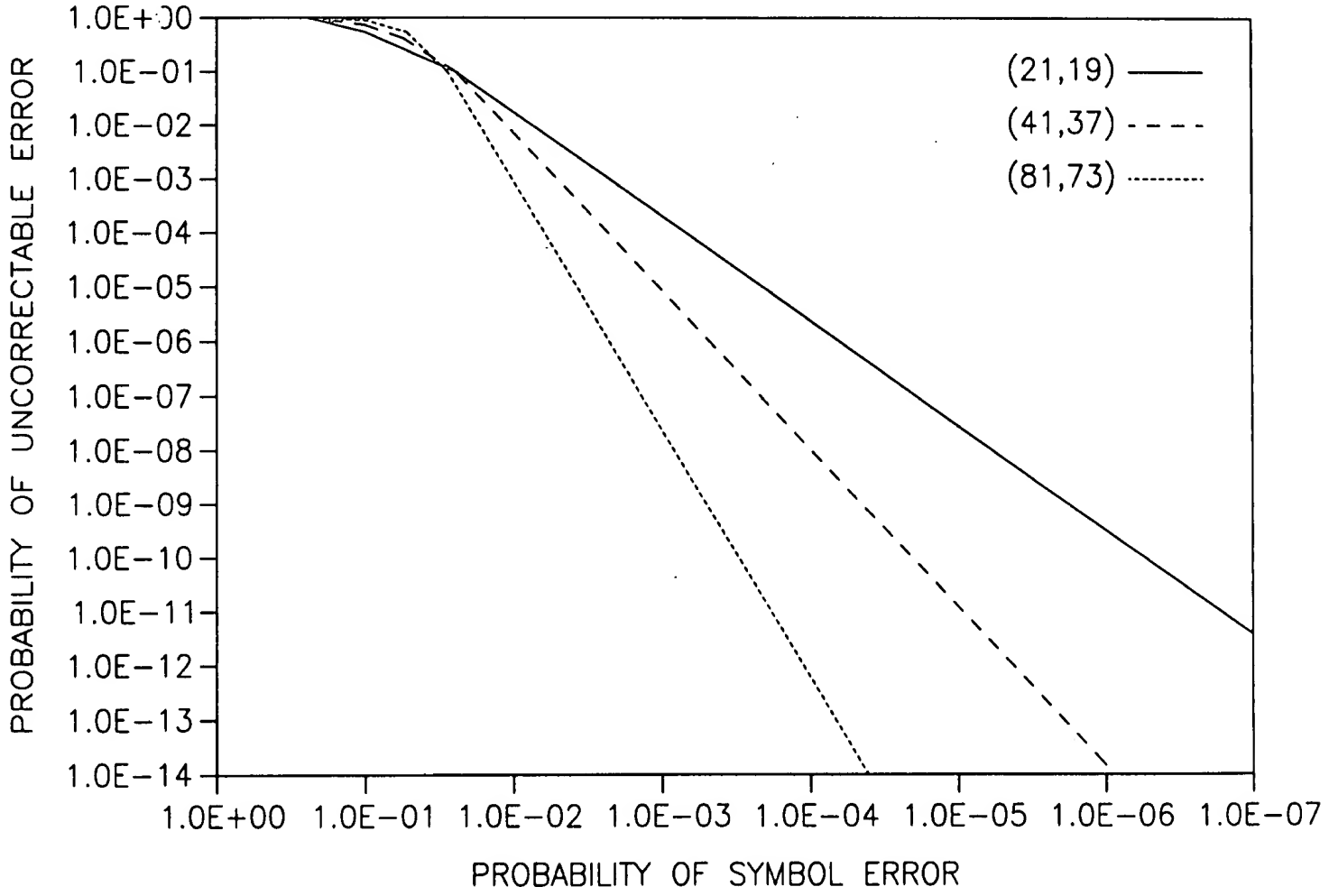

FIG. 54

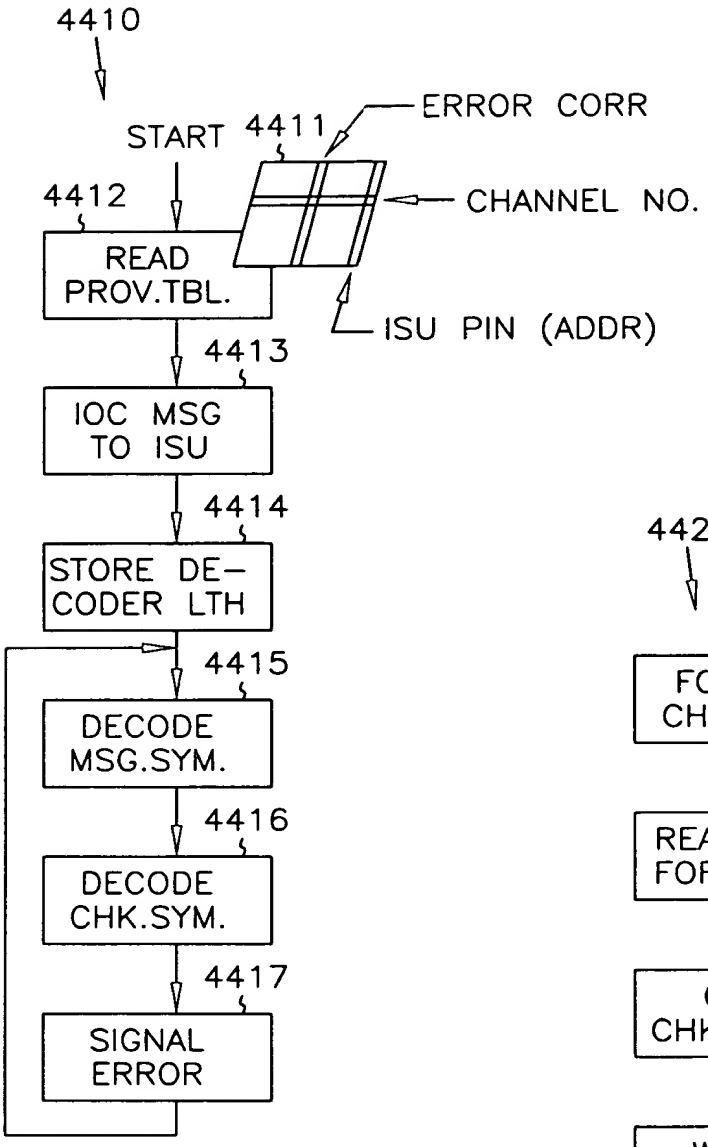
4410
START
4411
ERROR CORR
4412
CHANNEL NO.
READ PROV.TBL.
ISU PIN (ADDR)
4413
IOC MSG TO ISU
4414
STORE DE-CODER LTH
4415
DECODE MSG.SYM.
4416
DECODE CHK.SYM.
4417
SIGNAL ERROR

FIG. 55

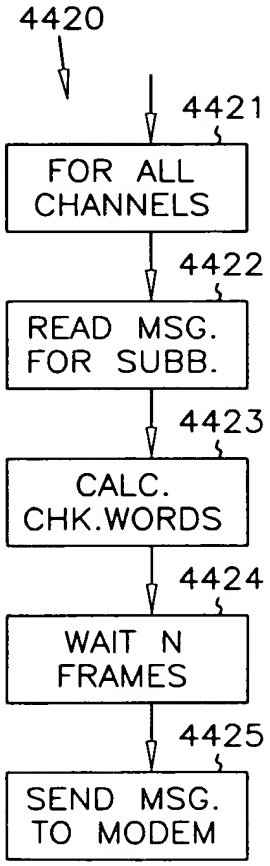
4420
4421
FOR ALL CHANNELS
4422
READ MSG. FOR SUBB.
4423
CALC. CHK.WORDS
4424
WAIT N FRAMES
4425
SEND MSG. TO MODEM

FIG. 56

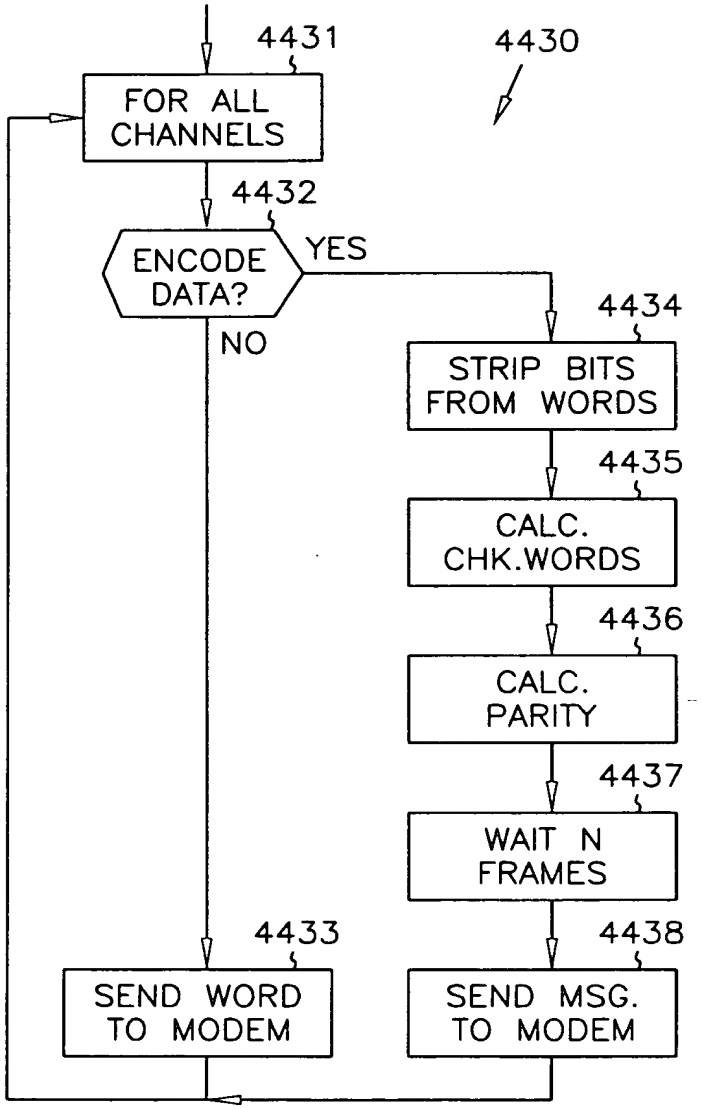
4431
4430
FOR ALL CHANNELS
4432
ENCODE DATA?
YES
NO
4434
STRIP BITS FROM WORDS
4435
CALC. CHK.WORDS
4436
CALC. PARITY
4437
WAIT N FRAMES
4433
4438
SEND WORD TO MODEM
SEND MSG. TO MODEM

FIG. 57

TO6020"4270660

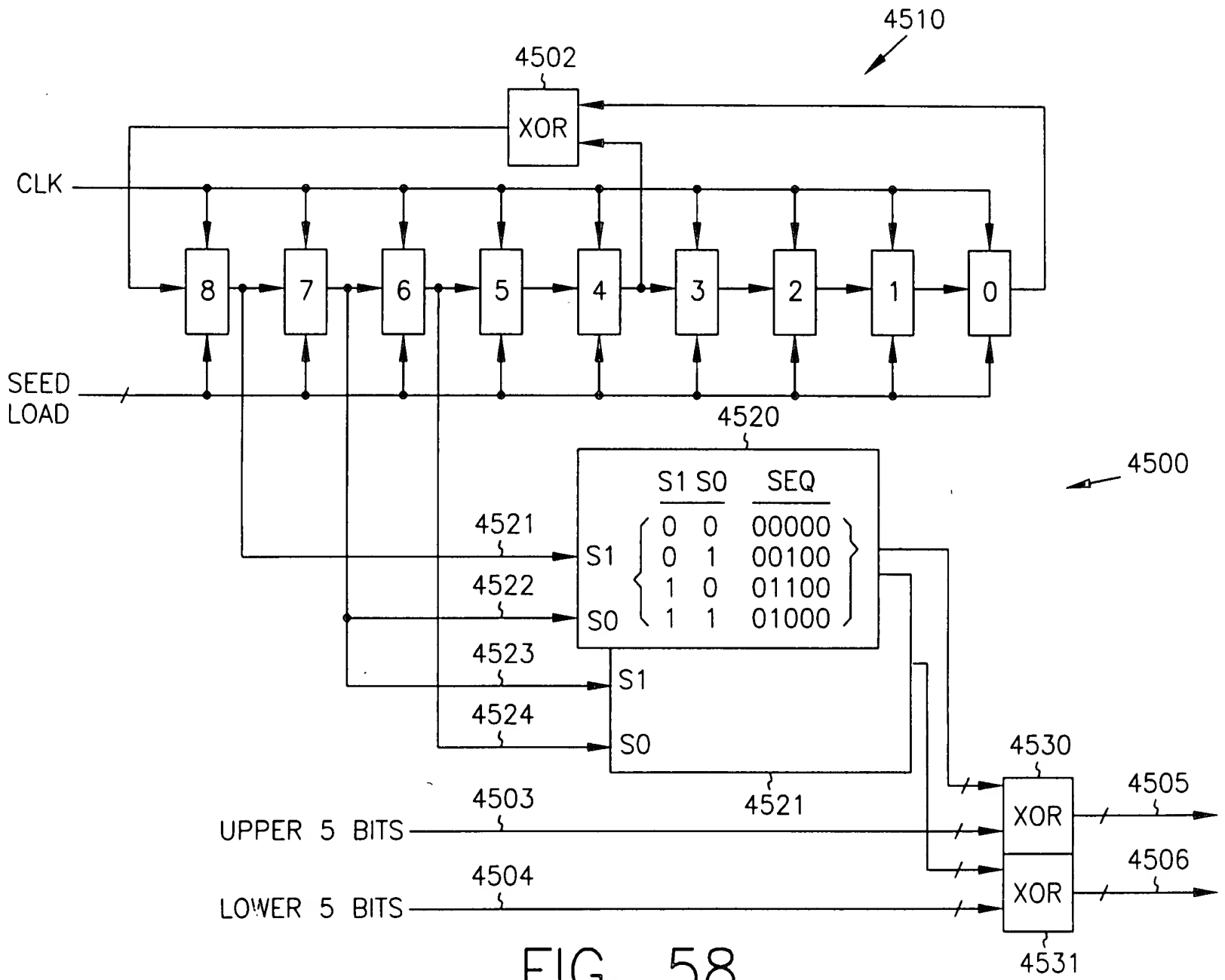

FIG. 58

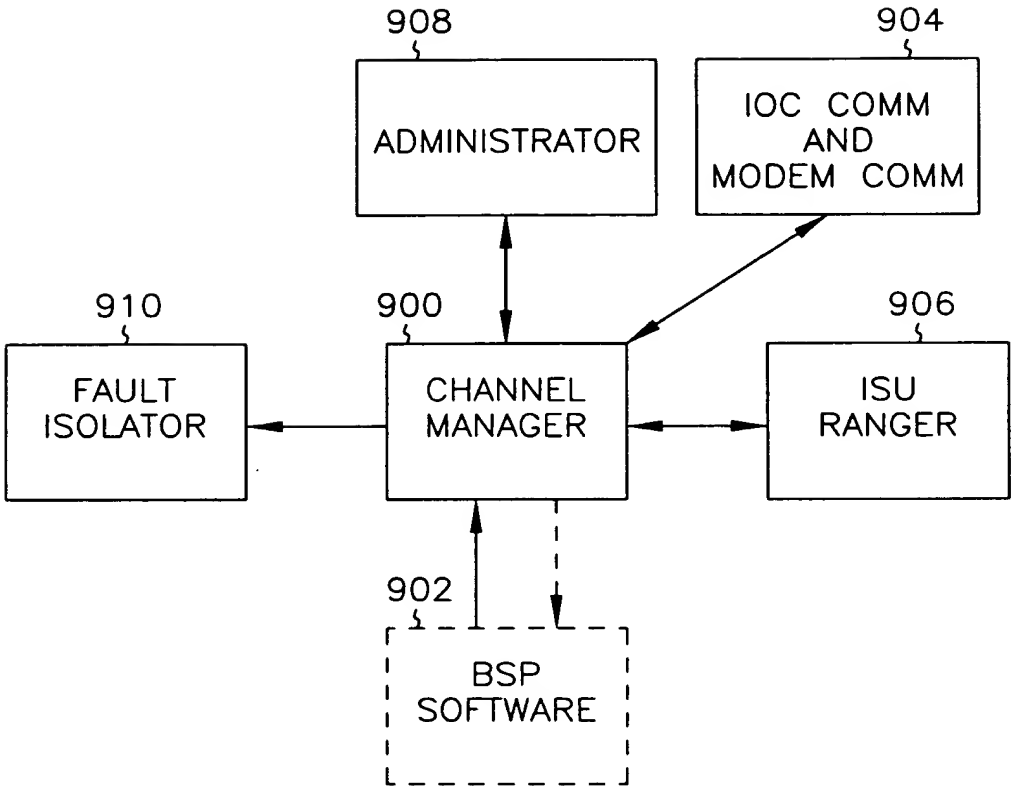
908
ADMINISTRATOR
904
IOC COMM AND MODEM COMM
910
FAULT ISOLATOR
900
CHANNEL MANAGER
906
ISU RANGER
902
BSP SOFTWARE

FIG. 59

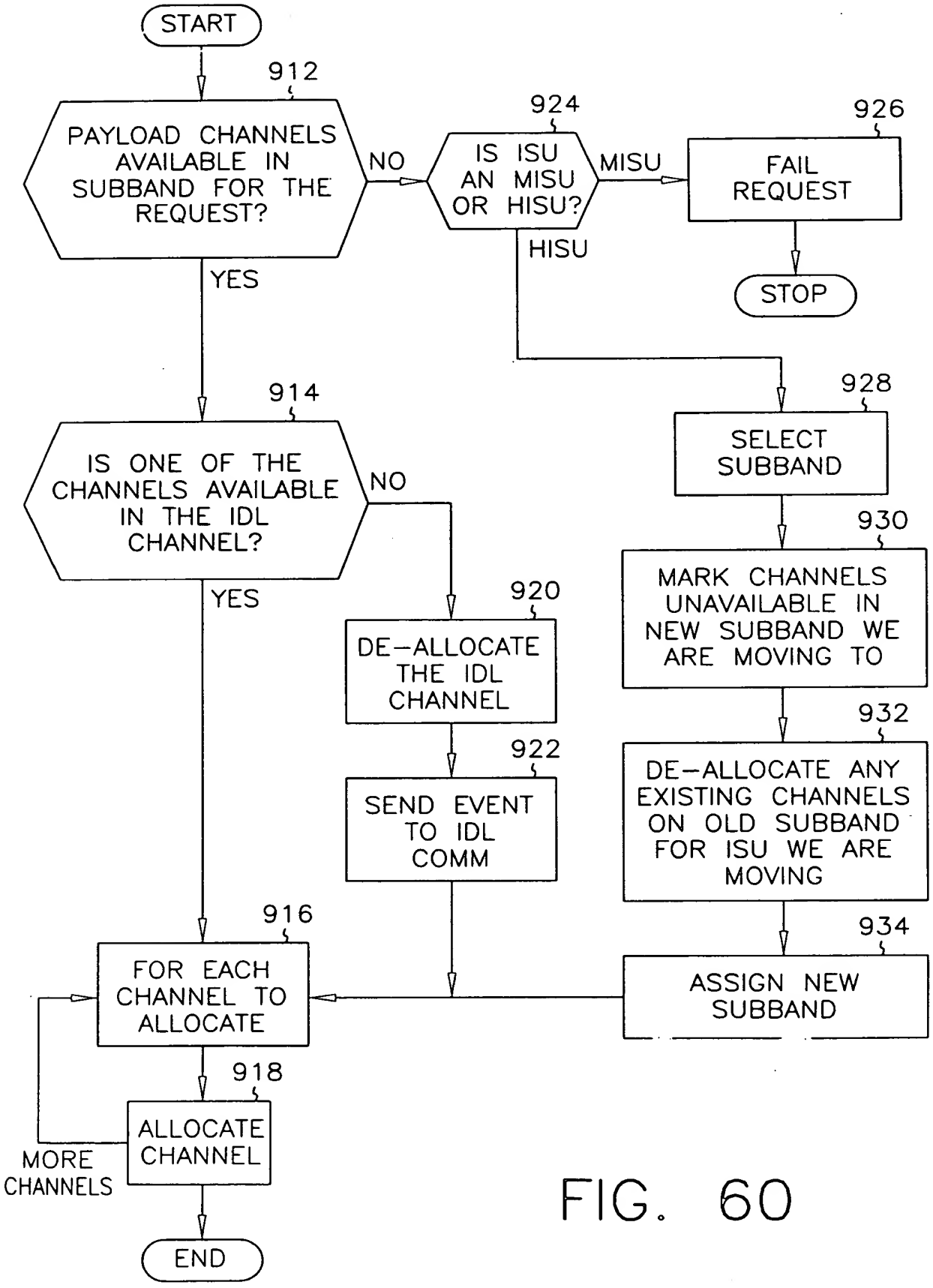
START
912
PAYLOAD CHANNELS AVAILABLE IN SUBBAND FOR THE REQUEST?
NO
924
IS ISU AN MISU OR HISU?
MISU
926
FAIL REQUEST
STOP
HISU
YES
914
IS ONE OF THE CHANNELS AVAILABLE IN THE IDL CHANNEL?
NO
YES
920
DE-ALLOCATE THE IDL CHANNEL
922
SEND EVENT TO IDL COMM
928
SELECT SUBBAND
930
MARK CHANNELS UNAVAILABLE IN NEW SUBBAND WE ARE MOVING TO
932
DE-ALLOCATE ANY EXISTING CHANNELS ON OLD SUBBAND FOR ISU WE ARE MOVING
934
ASSIGN NEW SUBBAND
916
FOR EACH CHANNEL TO ALLOCATE
918
ALLOCATE CHANNEL
MORE CHANNELS
END

FIG. 60

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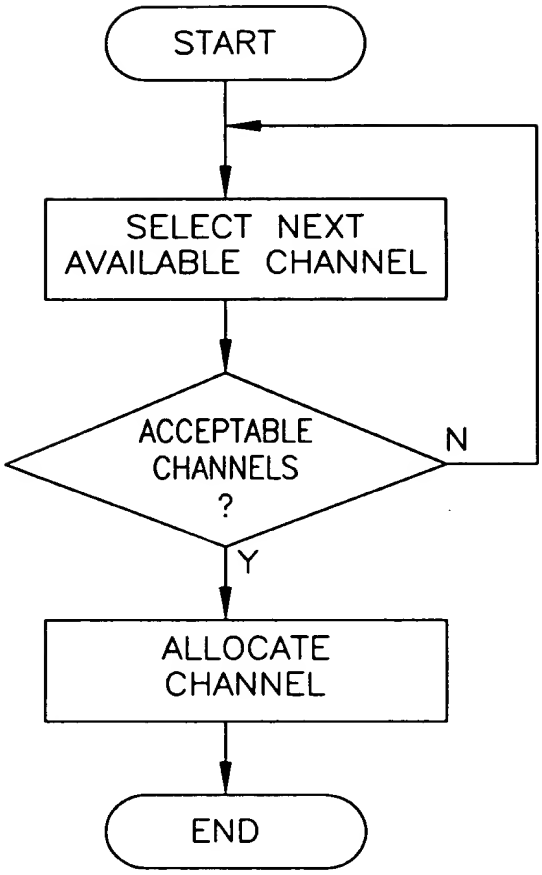


FIG. 61

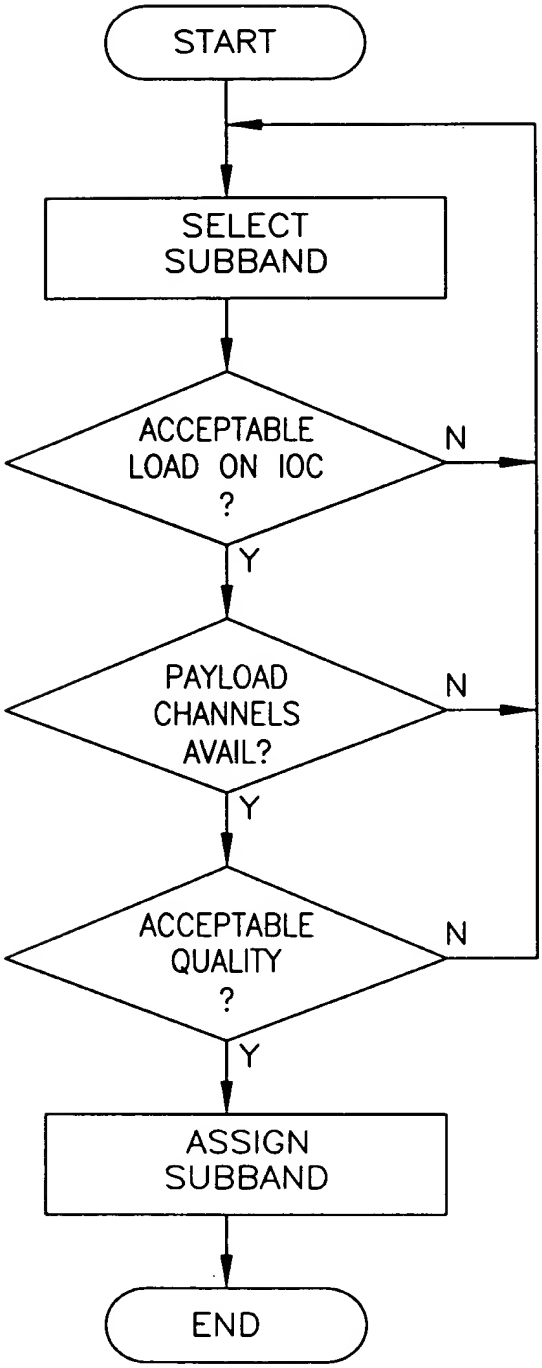

START
SELECT SUBBAND
ACCEPTABLE LOAD ON IOC ?
N
Y
PAYLOAD CHANNELS AVAIL?
N
Y
ACCEPTABLE QUALITY ?
N
Y
ASSIGN SUBBAND
END

FIG. 62

T06020"h2ET0660

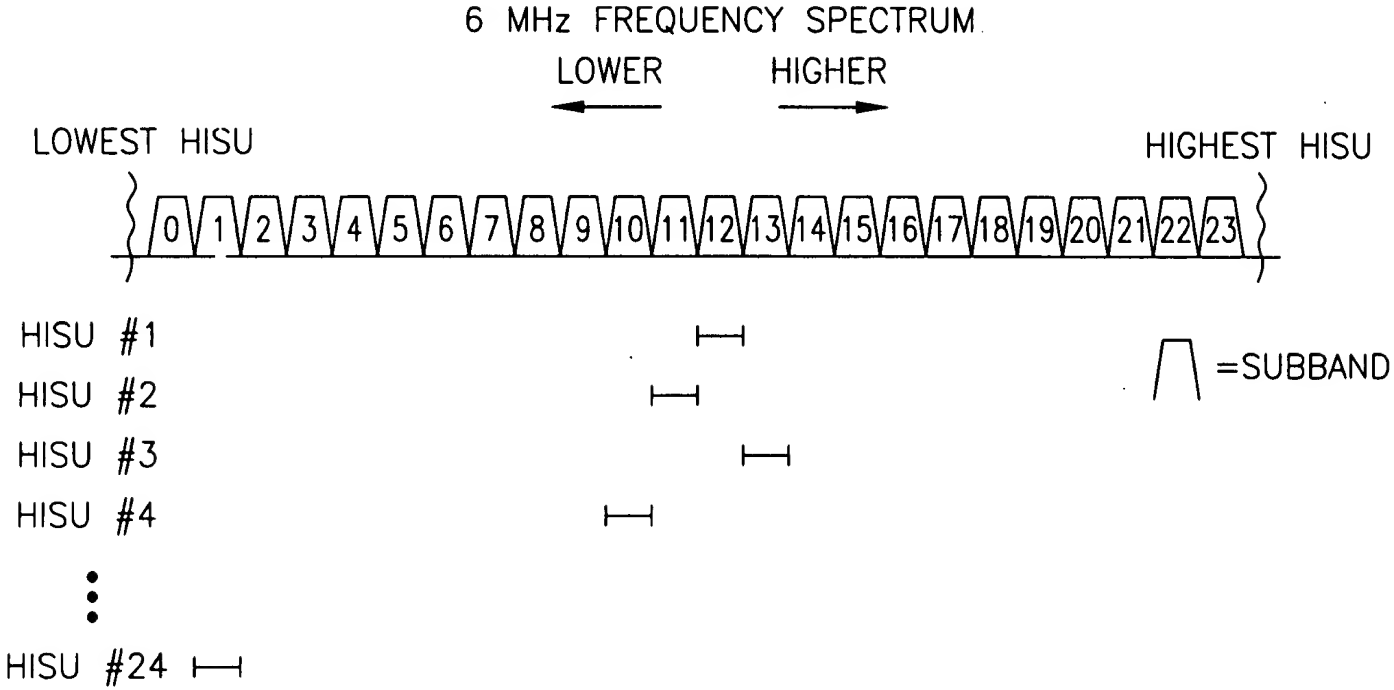


FIG. 63

T06820"h2ET0660

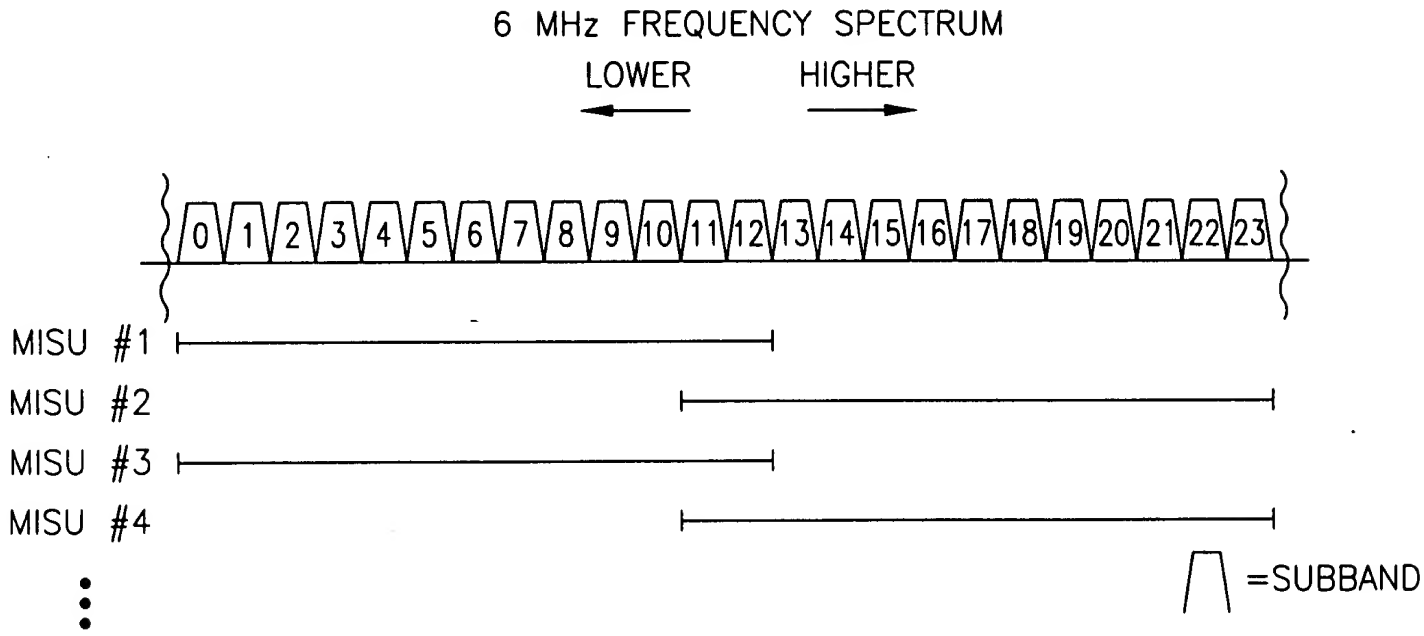


FIG. 64

T06020"t2ET0660

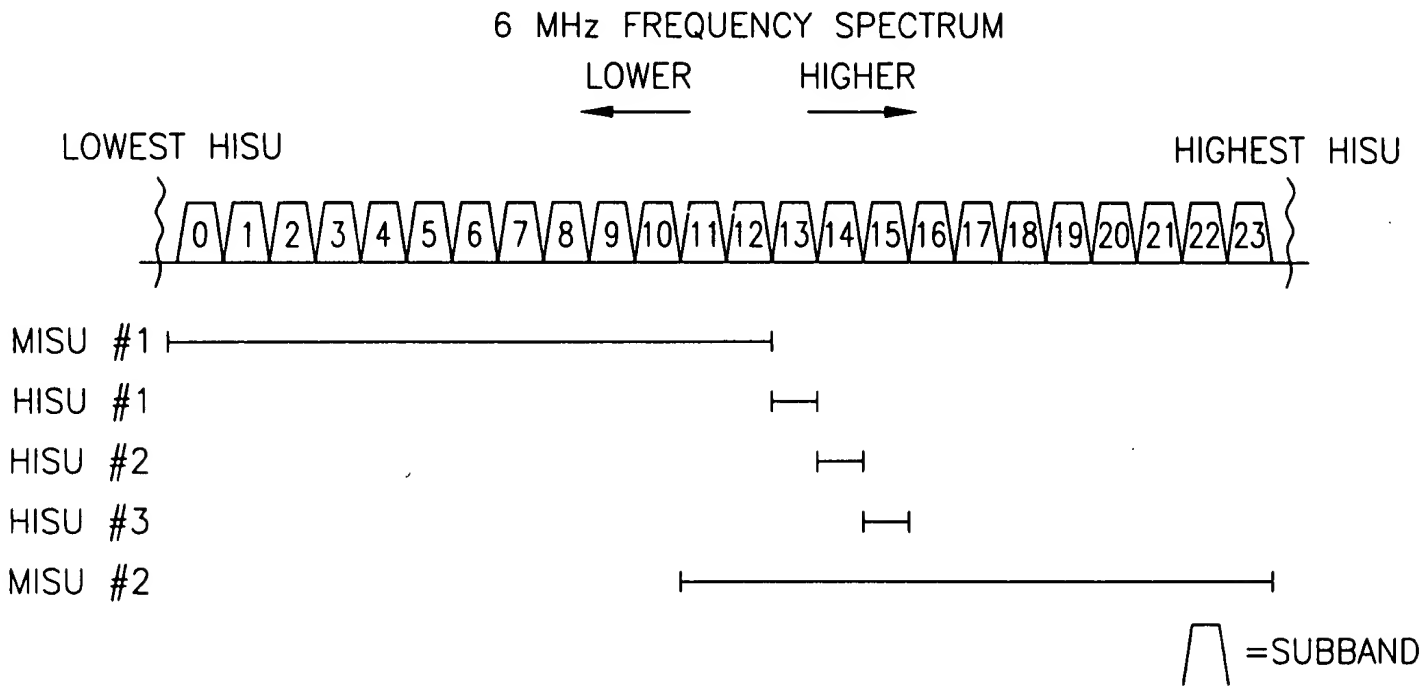


FIG. 65

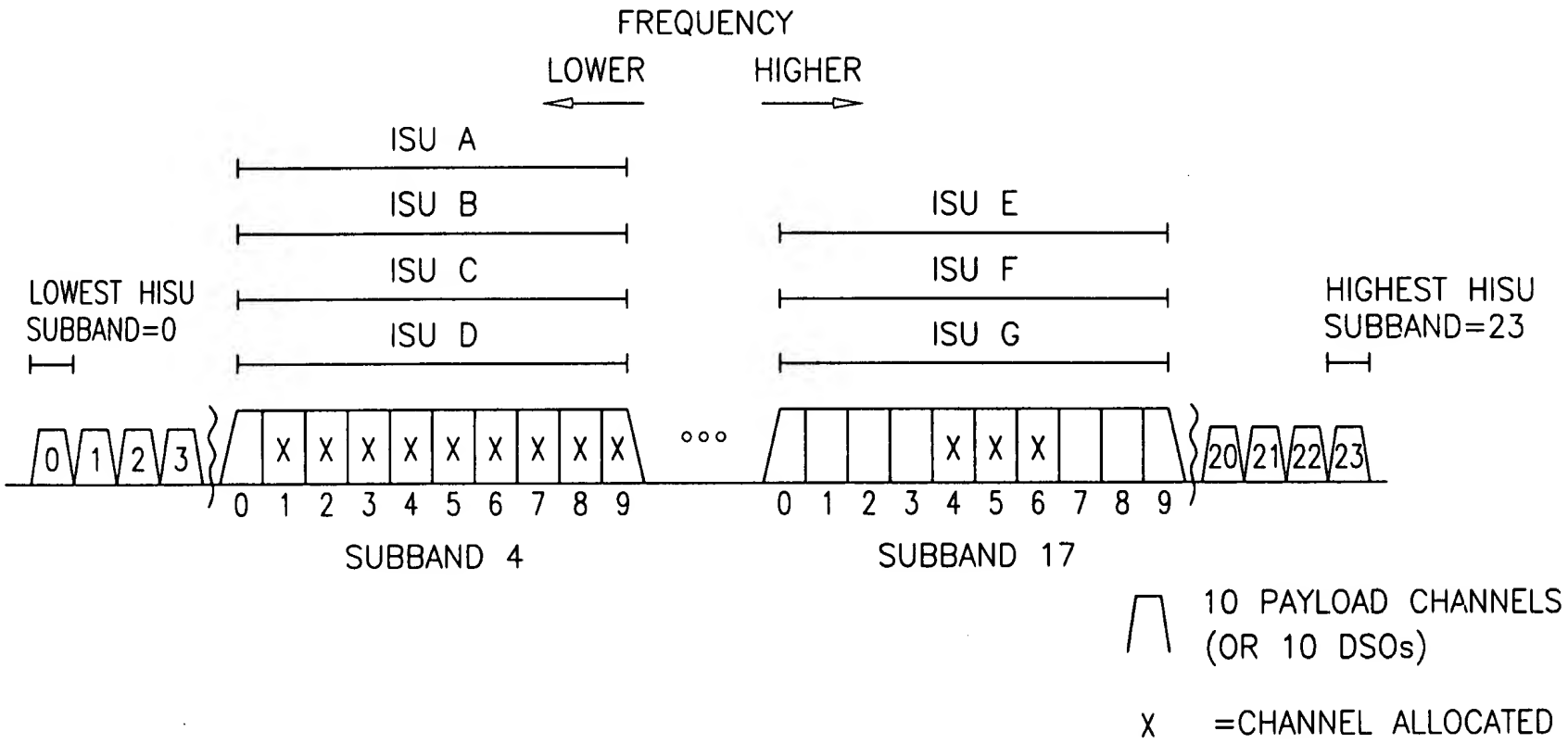

FREQUENCY
LOWER
HIGHER
ISU A
ISU B
ISU C
ISU D
ISU E
ISU F
ISU G
LOWEST HISU
SUBBAND=0
HIGHEST HISU
SUBBAND=23
0 1 2 3
X X X X X X X X X X
0 1 2 3 4 5 6 7 8 9
SUBBAND 4
X X X
0 1 2 3 4 5 6 7 8 9
SUBBAND 17
20 21 22 23
10 PAYLOAD CHANNELS
(OR 10 DSOs)
X =CHANNEL ALLOCATED

FIG. 66

T06020"h2ET0660

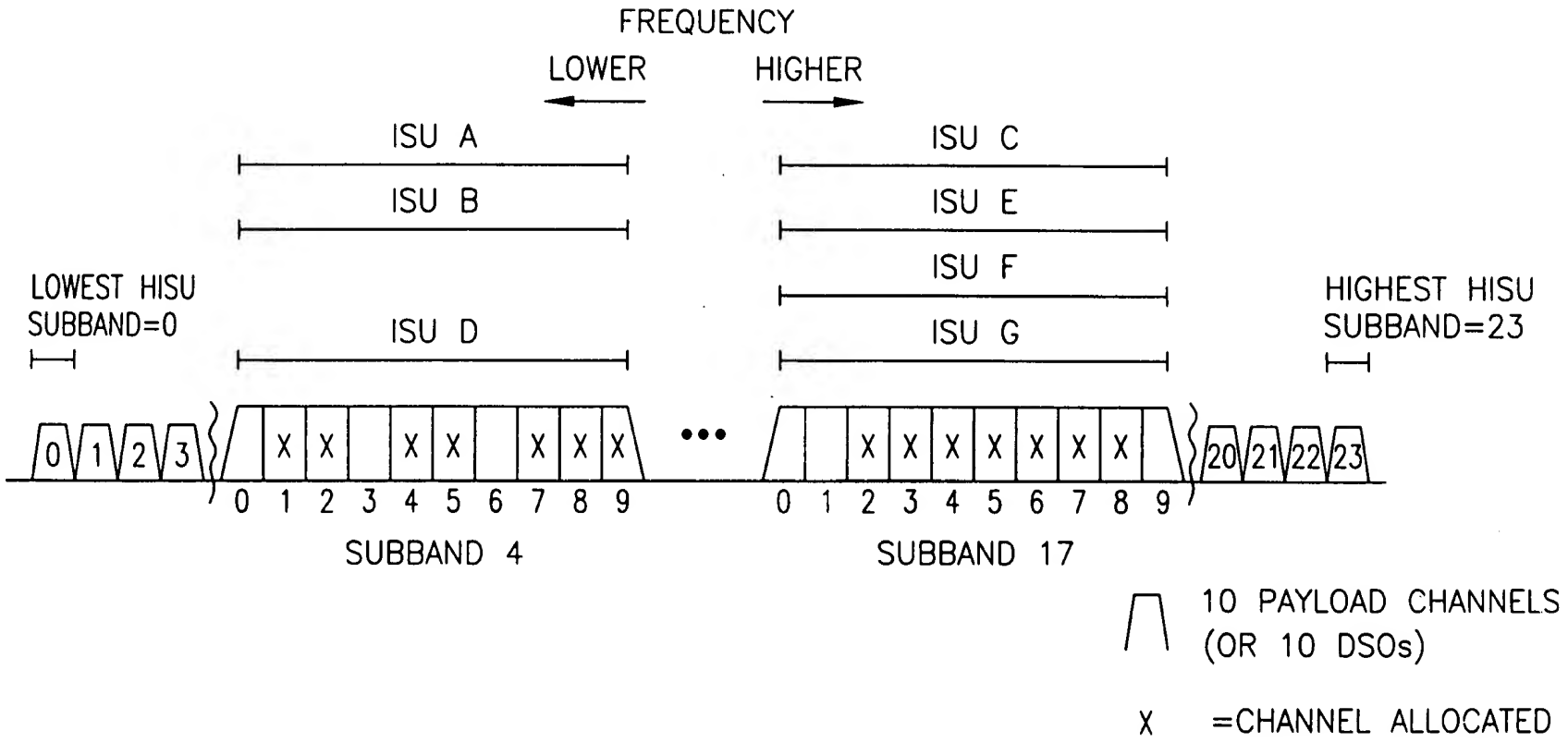


FIG. 67

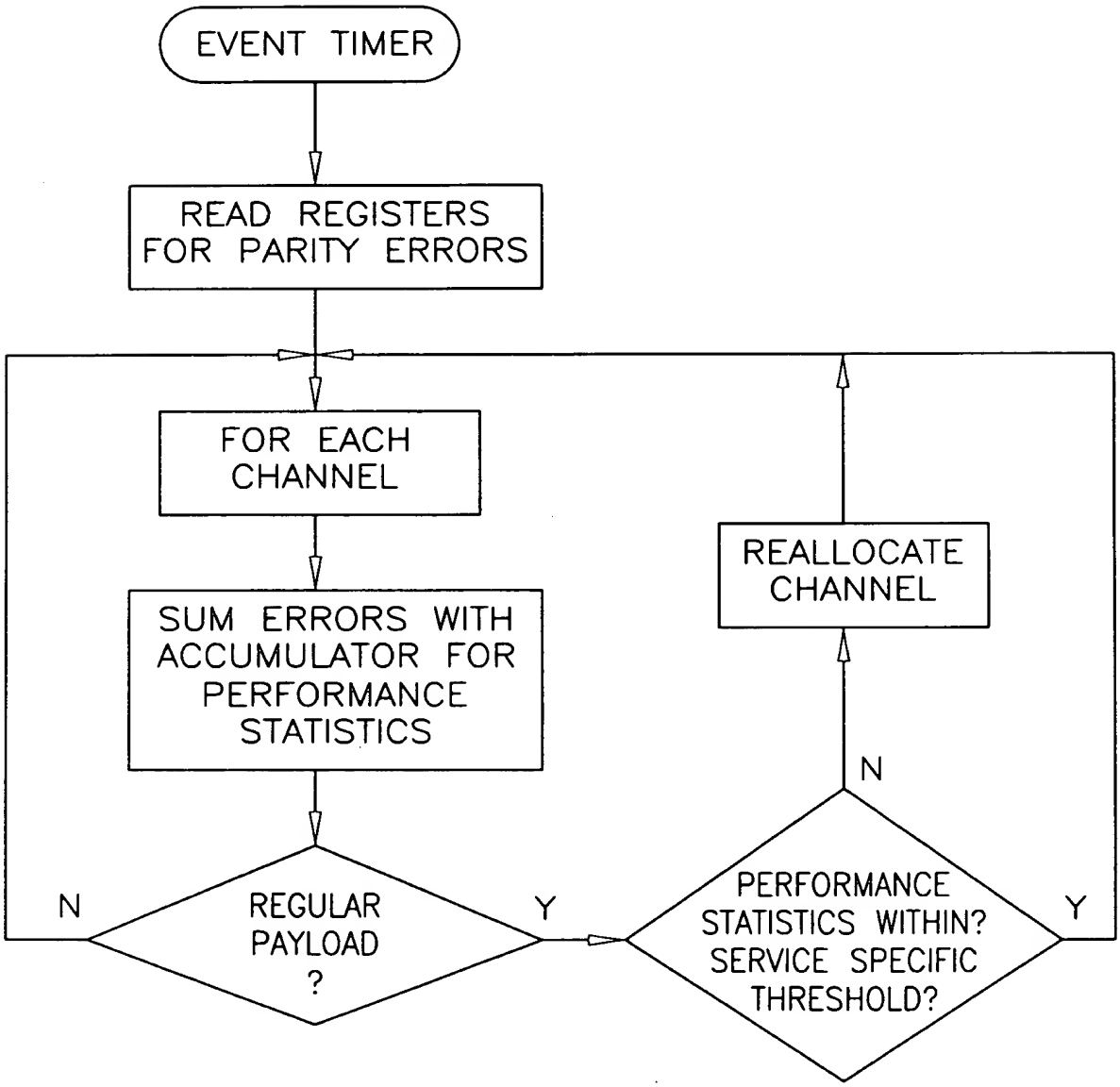

EVENT TIMER
READ REGISTERS FOR PARITY ERRORS
FOR EACH CHANNEL
SUM ERRORS WITH ACCUMULATOR FOR PERFORMANCE STATISTICS
REGULAR PAYLOAD ?
N
Y
PERFORMANCE STATISTICS WITHIN? SERVICE SPECIFIC THRESHOLD?
N
Y
REALLOCATE CHANNEL

FIG. 68

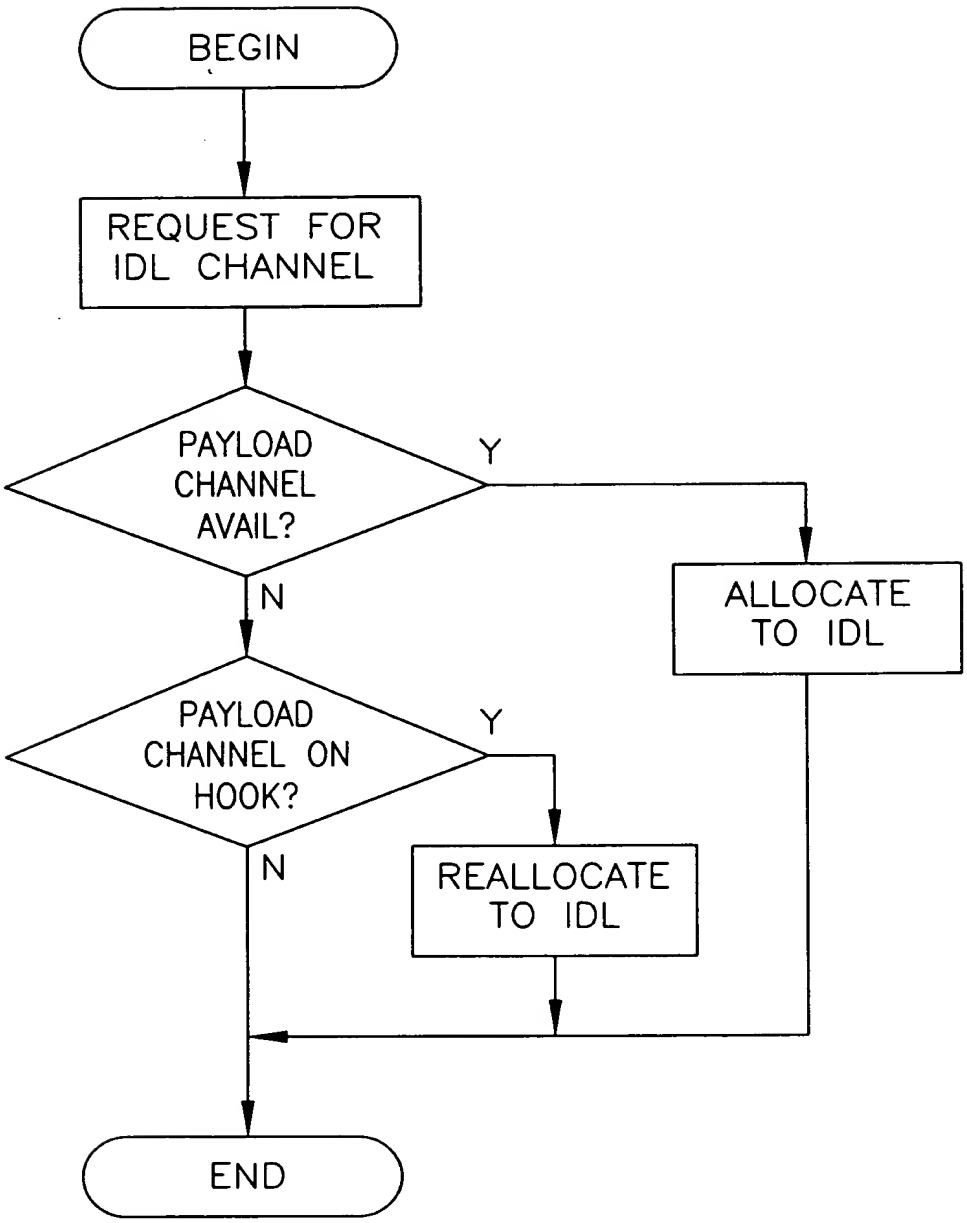

BEGIN
REQUEST FOR IDL CHANNEL
PAYLOAD CHANNEL AVAIL?
Y
N
ALLOCATE TO IDL
PAYLOAD CHANNEL ON HOOK?
Y
N
REALLOCATE TO IDL
END

FIG. 69

T06020"h2ET0660

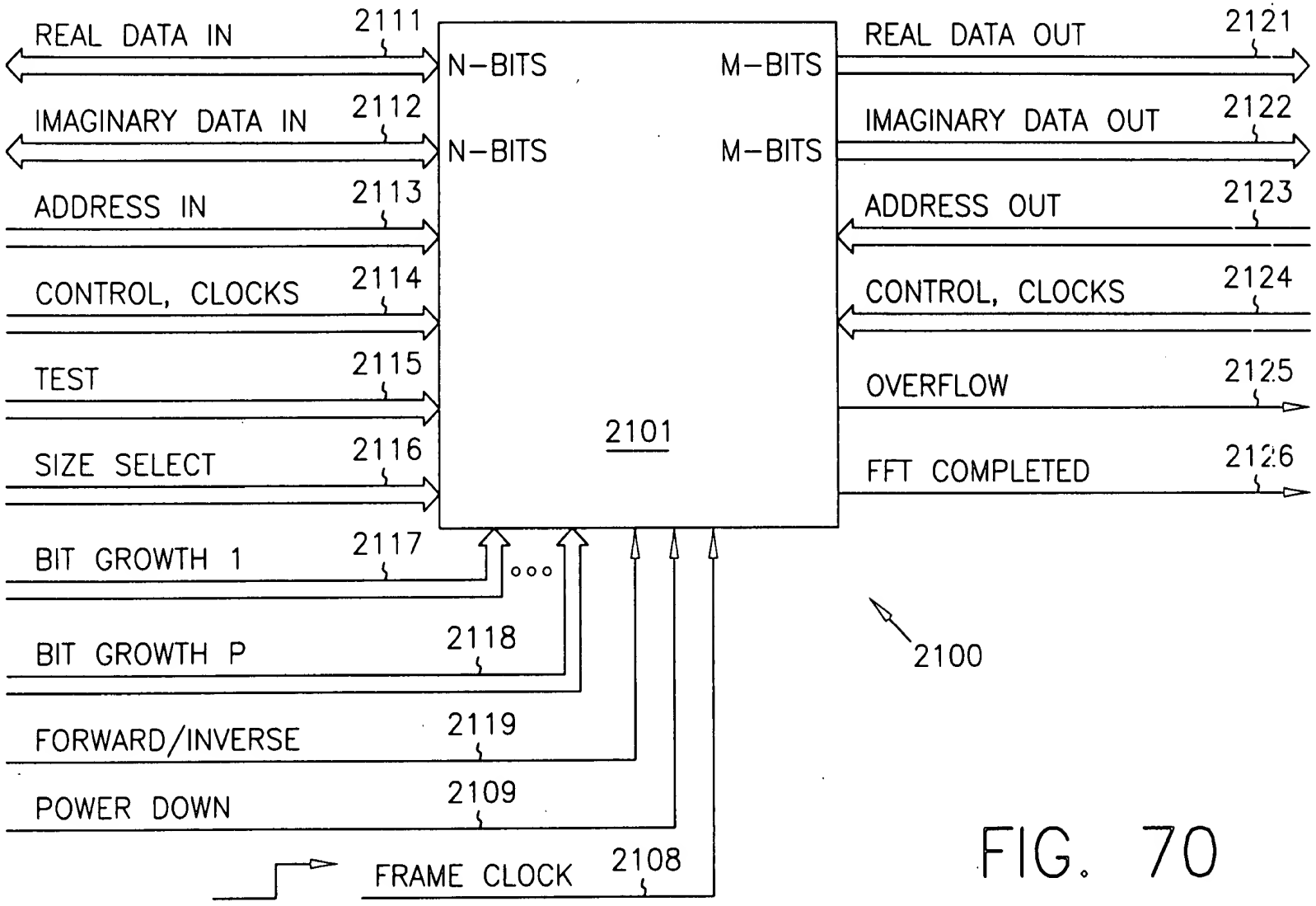


FIG. 70

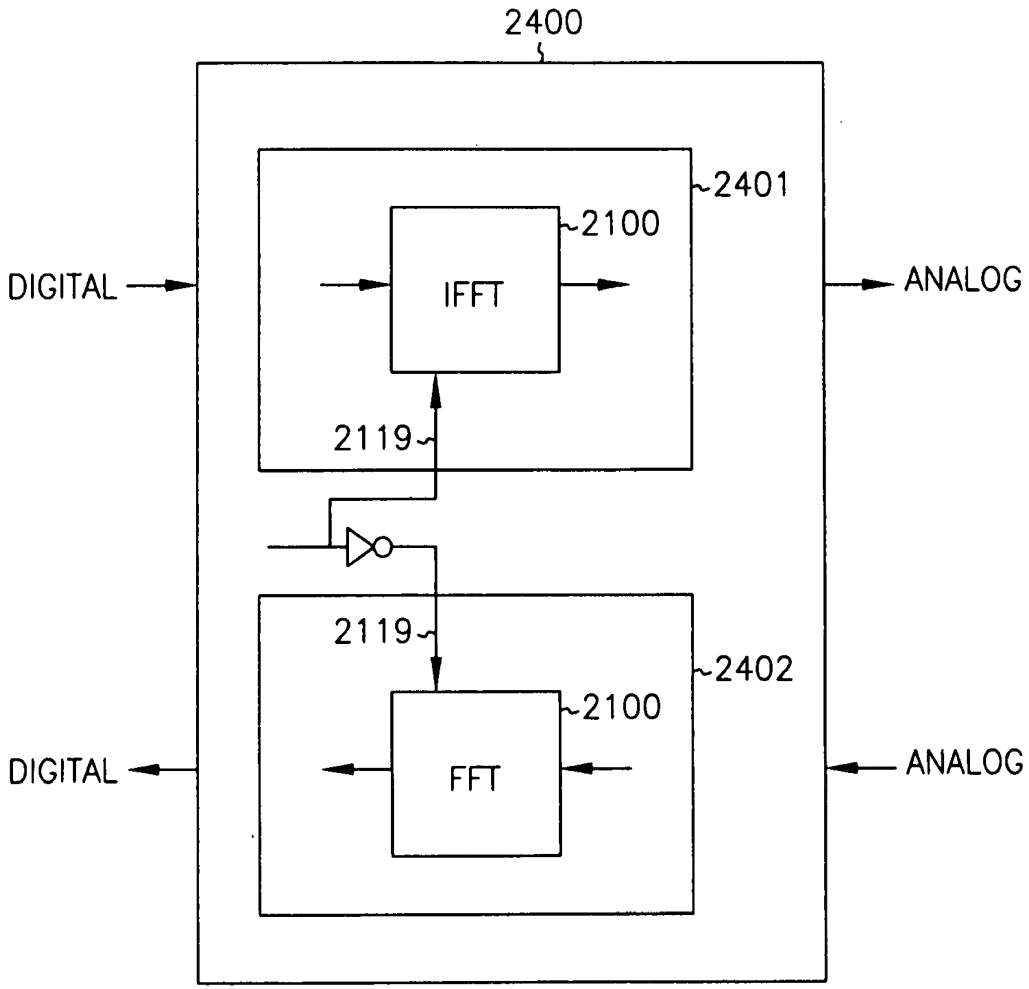

2400
2401
2100
IFFT
DIGITAL
ANALOG
2119
2119
2402
2100
FFT
DIGITAL
ANALOG

FIG. 71

T06020 "42T0660

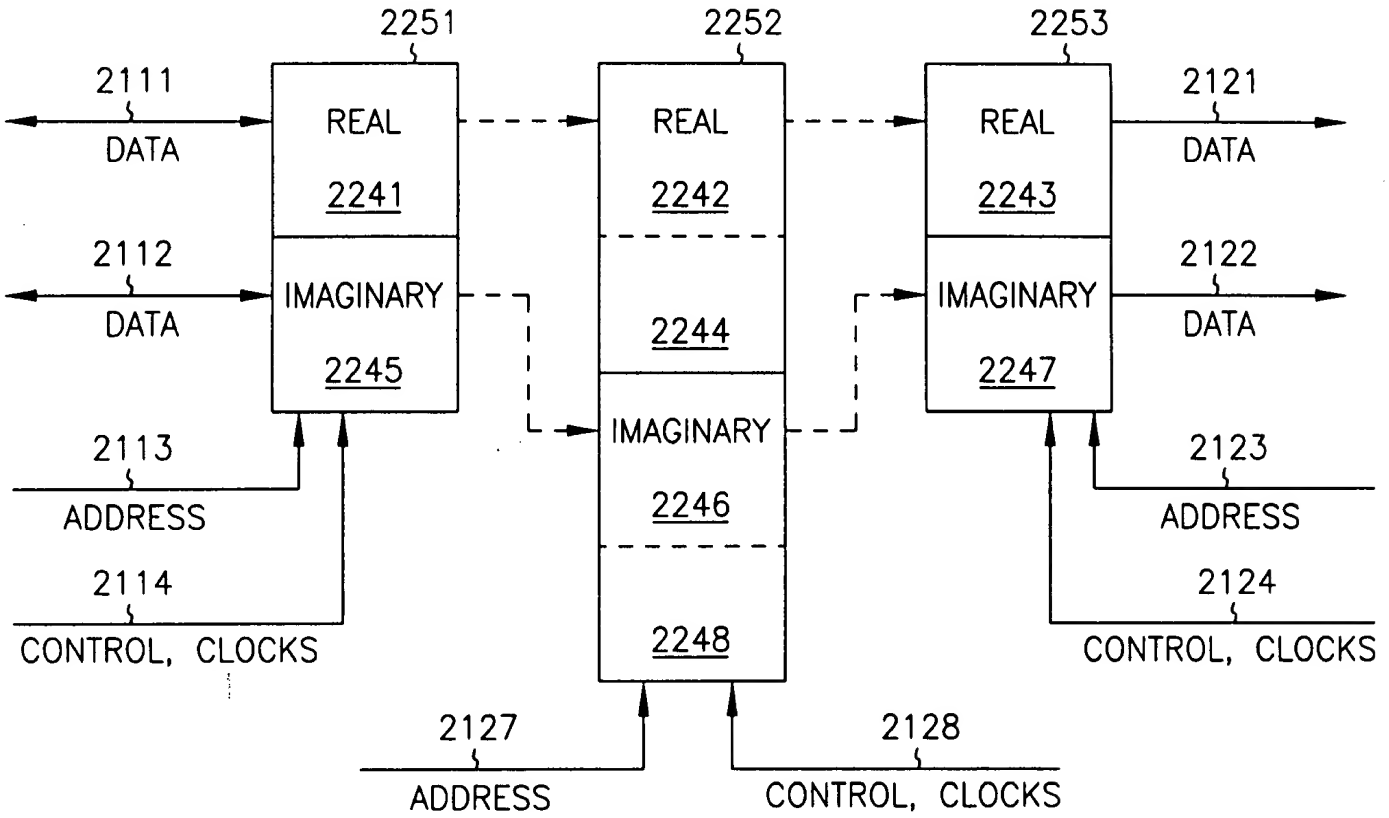


FIG. 72

T06020 "4270660

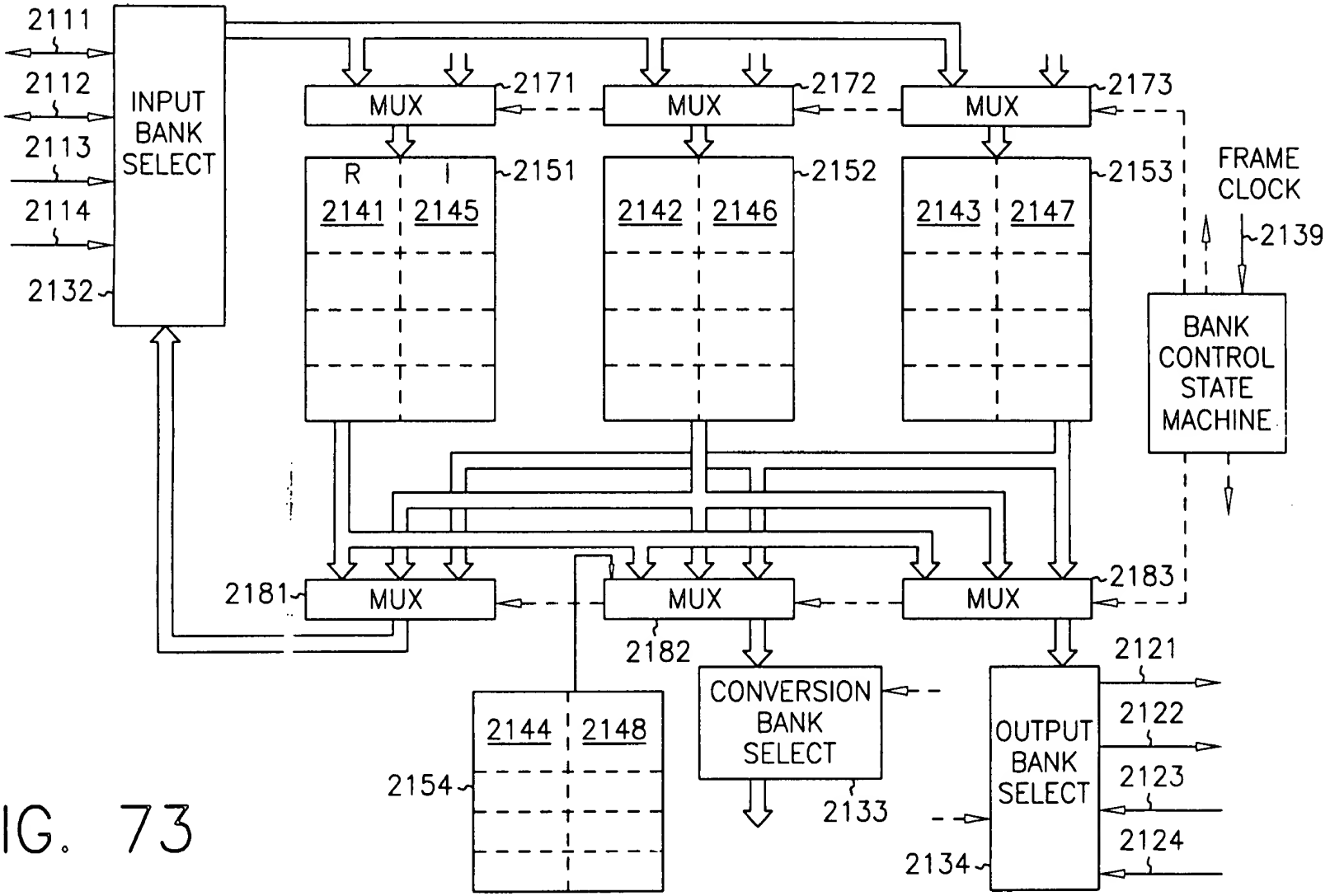
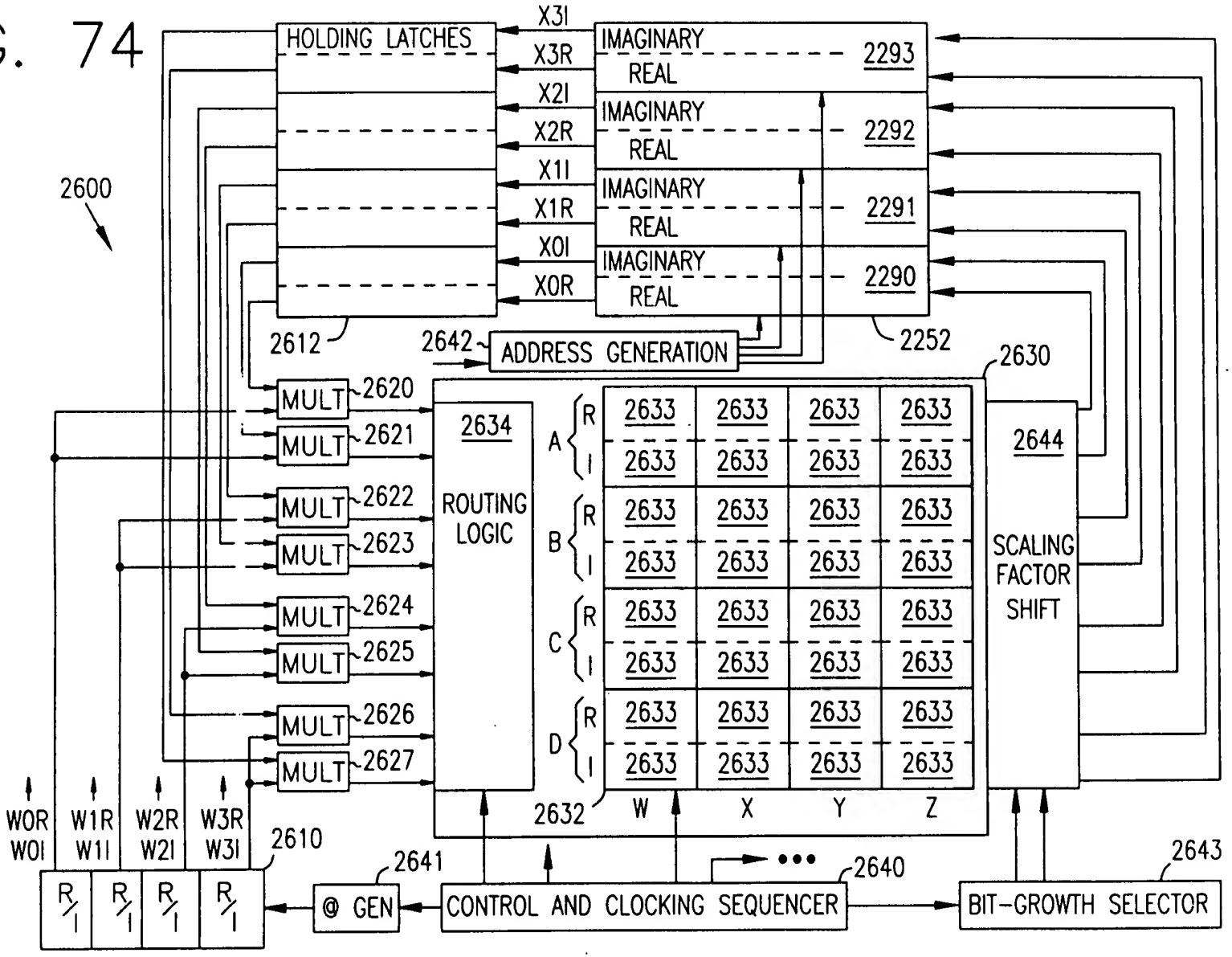


FIG. 73

TOSHIBA HZ8T0660

FIG. 74



THIS TABLE SHOWS THE ORDER OF CALCULATION FOR A TRANSPOSED BUTTERFLY:

C0

AWR=WR AWI =WI	AXR =XR AXI =XI	AYR =YR AYI =YI	AZR =ZR AZI =ZI
BWR=WR BWI =WI	BXR=XR BXI =XI	BYR =YR BYI =YI	BZR=ZR BZI =ZI
CWR=WR CWI =WI	CXR=XR CXI =XI	CYR =YR CYI =YI	CZR=ZR CZI =ZI
DWR =WR DWI =WI	DXR=XR DXI =XI	DYR=YR DYI =YI	DZR=ZR DZI =ZI

~2632

2800

FIG. 75

CI

AWR=AWR −WI AWI=AWI +WR	AXR=AXR −XI AXI=AXI +XR	AYR=AYR −YI AYI=AYI +YR	AZR=AZR −ZI AZI=AZI +ZR
BWR=BWR−WI BWI=BWI +WR	BXR=BXR −XI BXI=BXI +XR	BYR=BYR −YI BYI=BYI +YR	BZR=BZR −ZI BZI=BZI +ZR
CWR=CWR−WI CWI=CWI +WR	CXR=CXR −XI CXI=CXI +XR	CYR=CYR −YI CYI=CYI +YR	CZR=CZR −ZI CZI=CZI +ZR
DWR=DWR−WI DWI=DWI +WR	DXR=DXR −XI DXI=DXI +XR	DYR=DYR −YI DYI=DYI +YR	DZR=DZR −ZI DZI=DZI +ZR

~2632

2800

FIG. 76

C2

AWR=AWR +WR AWI=AWI +WI	AXR=AXR +XI AXI=AXI −XR	AYR=AYR −YR AYI=AYI −YI	AZR=AZR −ZI AZI=AZI +ZR
BWR=BWR+WR BWI=BWI +WI	BXR=BXR +XI BXI=BXI −XR	BYR=BYR −YR BYI=BYI −YI	BZR=BZR −ZI BZI=BZI +ZR
CWR=CWR+WR CWI=CWI +WI	CXR=CXR +XI CXI=CXI −XR	CYR=CYR −YR CYI=CYI −YI	CZR=CZR −ZI CZI=CZI +ZR
DWR=DWR+WR DWI=DWI +WI	DXR=DXR +XI DXI=DXI −XR	DYR=DYR −YR DYI=DYI −YI	DZR=DZR −ZI DZI=DZI +ZR

2632

2800

FIG. 77

C3

AWR=AWR −WI AWI=AWI +WR	AXR=AXR +XR AXI=AXI +XI	AYR=AYR +YI AYI=AYI −YR	AZR=AZR −ZR AZI=AZI −ZI
BWR=BWR−WI BWI=BWI +WR	BXR=BXR +XR BXI=BXI +XI	BYR=BYR +YI BYI=BYI −YR	BZR=BZR −ZR BZI=BZI −ZI
CWR=CWR−WI CWI=CWI +WR	CXR=CXR +XR CXI=CXI +XI	CYR=CYR +YI CYI=CYI −YR	CZR=CZR −ZR CZI=CZI −ZI
DWR=DWR−WI DWI=DWI +WR	DXR=DXR +XR DXI=DXI +XI	DYR=DYR +YI DYI=DYI −YR	DZR=DZR −ZR DZI=DZI −ZI

2632

2800

FIG. 78

C4

AWR=AWR +WR AWI=AWI +WI	AXR=AXR --XR AXI=AXI −XI	AYR=AYR +YR AYI=AYI +YI	AZR=AZR −ZR AZI=AZI −ZI
BWR=BWR+WR BWI=BWI +WI	BXR=BXR −XR BXI=BXI −XI	BYR=BYR +YR BYI=BYI +YI	BZR=BZR −ZR BZI=BZI −ZI
CWR=CWR+WR CWI=CWI +WI	CXR=CXR −XR CXI=CXI −XI	CYR=CYR +YR CYI=CYI +YI	CZR=CZR −ZR CZI=CZI −ZI
DWR=DWR+WR DWI=DWI +WI	DXR=DXR −XR DXI=DXI −XI	DYR=DYR +YR DYI=DYI +YI	DZR=DZR −ZR DZI=DZI −ZI

~2632

2800

FIG. 79

C5

AWR=AWR −WI AWI=AWI +WR	AXR=AXR +XI AXI=AXI −XR	AYR=AYR −YI AYI=AYI +YR	AZR=AZR +ZI AZI=AZI −ZR
BWR=BWR−WI BWI=BWI +WR	BXR=BXR +XI BXI=BXI −XR	BYR=BYR −YI BYI=BYI +YR	BZR=BZR +ZI BZI=BZI −ZR
CWR=CWR−WI CWI=CWI +WR	CXR=CXR +XI CXI=CXI −XR	CYR=CYR −YI CYI=CYI +YR	CZR=CZR +ZI CZI=CZI −ZR
DWR=DWR−WI DWI=DWI +WR	DXR=DXR +XI DXI=DXI −XR	DYR=DYR −YI DYI=DYI +YR	DZR=DZR +ZI DZI=DZI −ZR

~2632

2800

FIG. 80

C6

AWR=AWR +WR AWI=AWI +WI	AXR=AXR −XI AXI=AXI +XR	AYR=AYR −YR AYI=AYI −YI	AZR=AZR +ZI AZI=AZI −ZR
BWR=BWR+WR BWI=BWI +WI	BXR=BXR −XI BXI=BXI +XR	BYR=BYR −YR BYI=BYI −YI	BZR=BZR +ZI BZI=BZI −ZR
CWR=CWR+WR CWI=CWI +WI	CXR=CXR −XI CXI=CXI +XR	CYR=CYR −YR CYI=CYI −YI	CZR=CZR +ZI CZI=CZI −ZR
DWR=DWR+WR DWI=DWI +WI	DXR=DXR −XI DXI=DXI +XR	DYR=DYR −YR DYI=DYI −YI	DZR=DZR +ZI DZI=DZI −ZR

~2632

2800

FIG. 81

C7

AWR=AWR −WI AWI=AWI +WR	AXR=AXR −XR AXI=AXI −XI	AYR=AYR +YI AYI=AYI −YR	AZR=AZR −ZR AZI=AZI +ZI
BWR=BWR−WI BWI=BWI +WR	BXR=BXR −XR BXI=BXI −XI	BYR=BYR +YI BYI=BYI −YR	BZR=BZR −ZR BZI=BZI +ZI
CWR=CWR−WI CWI=CWI +WR	CXR=CXR −XR CXI=CXI −XI	CYR=CYR +YI CYI=CYI −YR	CZR=CZR −ZR CZI=CZI +ZI
DWR=DWR−WI DWI=DWI +WR	DXR=DXR −XR DXI=DXI −XI	DYR=DYR +YI DYI=DYI −YR	DZR=DZR −ZR DZI=DZI +ZI

~2632

2800

FIG. 82

THIS TABLE SHOWS THE ORDER OF CALCULATION FOR A TRANSPOSED BUTTERFLY:

C0

2632

AWR =WR+XR+YR+ZR AWI =WI+XI+YI+ZI	AXR =WR−XI−YR+ZI AXI =WI+XR−YI−ZR	AYR =WR−XR+YR−ZR AYI =WI−XI+YI−ZI	AZR =WR+XI−YR−ZI AZI =WI−XR−YI+ZR
− −	− −	− −	− −
− −	− −	− −	− −
− −	− −	− −	− −

2810

FIG. 83

C1

2632

AWR =AWR−(WI+XI+YI+ZI) AWI =AWI+(WR+XR+YR+ZR)	AXR =AXR−(WI+XR−YI−ZR) AXI =AXI+(WR−XI−YR+ZI)	AYR =AYR−(WI−XI+YI−ZI) AYI =AYI+(WR−XR+YR−ZR)	AZR =AZR−(WI−XR−YI+ZR) AZI =AZI+(WR+XI−YR−ZI)
− −	− −	− −	− −
− −	− −	− −	− −
− −	− −	− −	− −

2810

FIG. 84

C2

2632

– –	– –	– –	– –
BWR =WR+XR+YR+ZR BWI =WI+XI+YI+ZI	BXR =WR−XI−YR+ZI BXI =WI+XR−YI−ZR	BYR =WR−XR+YR−ZR BYI =WI−XI+YI−ZI	BZR =WR+XI−YR−ZI BZI =WI−XR−YI+ZR
– –	– –	– –	– –
– –	– –	– –	– –

2810

FIG. 85

C3

2632

– –	– –	– –	– –
BWR =BWR−(WI+XI+YI+ZI) BWI =BWI+(WR+XR+YR+ZR)	BXR =BXR−(WI+XR−YI−ZR) BXI =BXI+(WR−XI−YR+ZI)	BYR =BYR−(WI−XI+YI−ZI) BYI =BYI+(WR−XR+YR−ZR)	BZR =BZR−(WI−XR−YI+ZR) BZI =BZI+(WR+XI−YR−ZI)
– –	– –	– –	– –
– –	– –	– –	– –

2810

FIG. 86

C4

2632

2810

– –	– –	– –	– –
– –	– –	– –	– –
CWR =WR+XR+YR+ZR CWI =WI+XI+YI+ZI	CXR =WR−XI−YR+ZI CXI =WI+XR−YI−ZR	CYR =WR−XR+YR−ZR CYI =WI−XI+YI−ZI	CZR =WR+XI−YR−ZI CZI =WI−XR−YI+ZR
– –	– –	– –	– –

FIG. 87

C5

2632

2810

– –	– –	– –	– –
– –	– –	– –	– –
CWR =CWR−(WI+XI+YI+ZI) CWI =CWI+(WR+XR+YR+ZR)	CXR =CXR−(WI+XR−YI−ZR) CXI =CXI+(WR−XI−YR+ZI)	CYR =CYR−(WI−XI+YI−ZI) CYI =CYI+(WR−XR+YR−ZR)	CZR =CZR−(WI−XR−YI+ZR) CZI =CZI+(WR+XI−YR−ZI)
– –	– –	– –	– –

FIG. 88

C6

2632

– –	– –	– –	– –
– –	– –	– –	– –
– –	– –	– –	– –
DWR =WR+XR+YR+ZR DWI =WI+XI+YI+ZI	DXR =WR−XI−YR+ZI DXI =WI+XR−YI−ZR	DYR =WR−XR+YR−ZR DYI =WI−XI+YI−ZI	DZR =WR+XI−YR−ZI DZI =WI−XR−YI+ZR

2810

FIG. 89

C7

2632

– –	– –	– –	– –
– –	– –	– –	– –
– –	– –	– –	– –
DWR =DWR−(WI+XI+YI+ZI) DWI =DWI+(WR+XR+YR+ZR)	DXR =DXR−(WI+XR−YI−ZR) DXI =DXI+(WR−XI−YR+ZI)	DYR =DYR−(WI−XI+YI−ZI) DYI =DYI+(WR−XR+YR−ZR)	DZR =DZR−(WI−XR−YI+ZR) DZI =DZI+(WR+XI−YR−ZI)

2810

FIG. 90

TD6020"h2ETD660

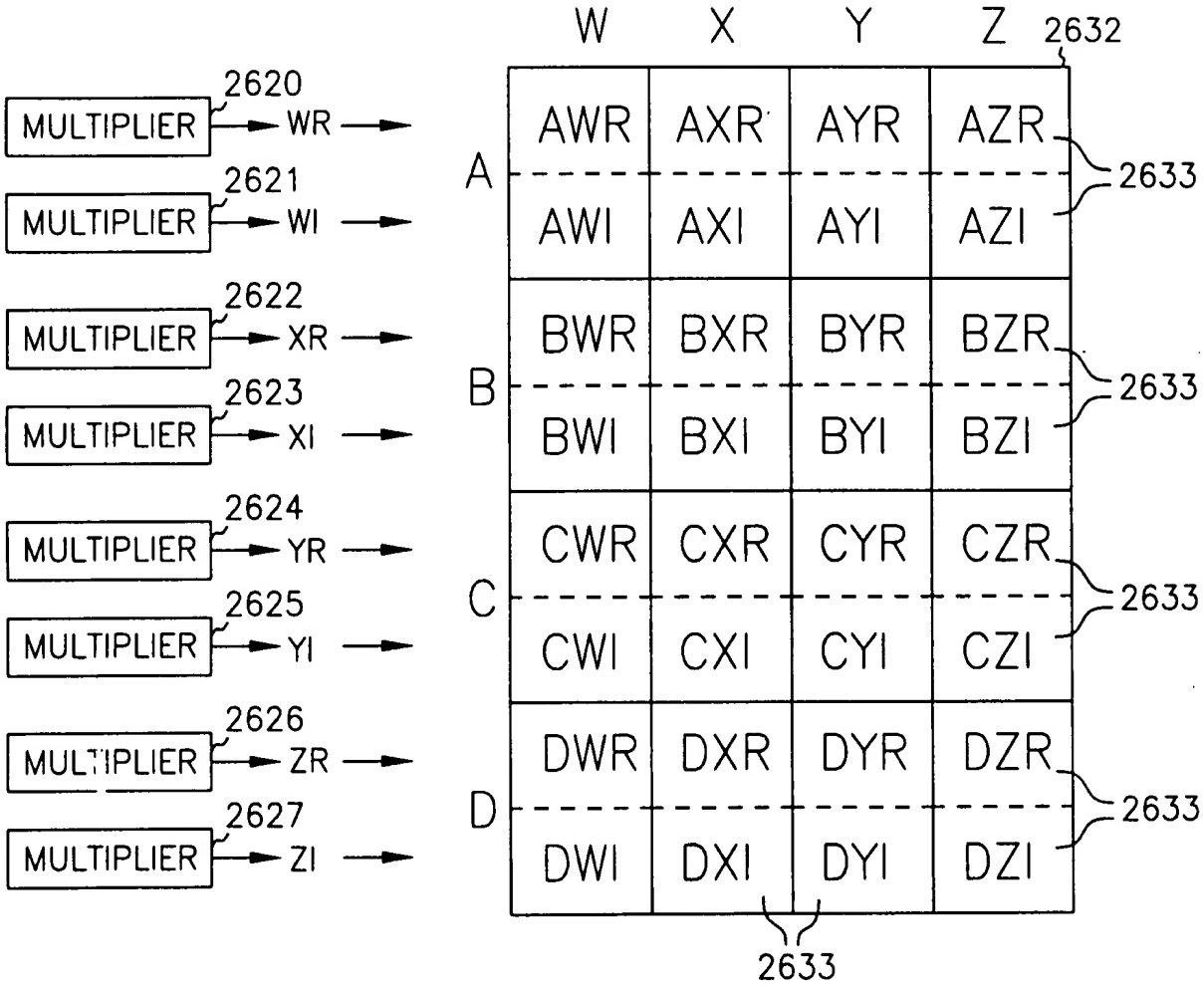


FIG. 91

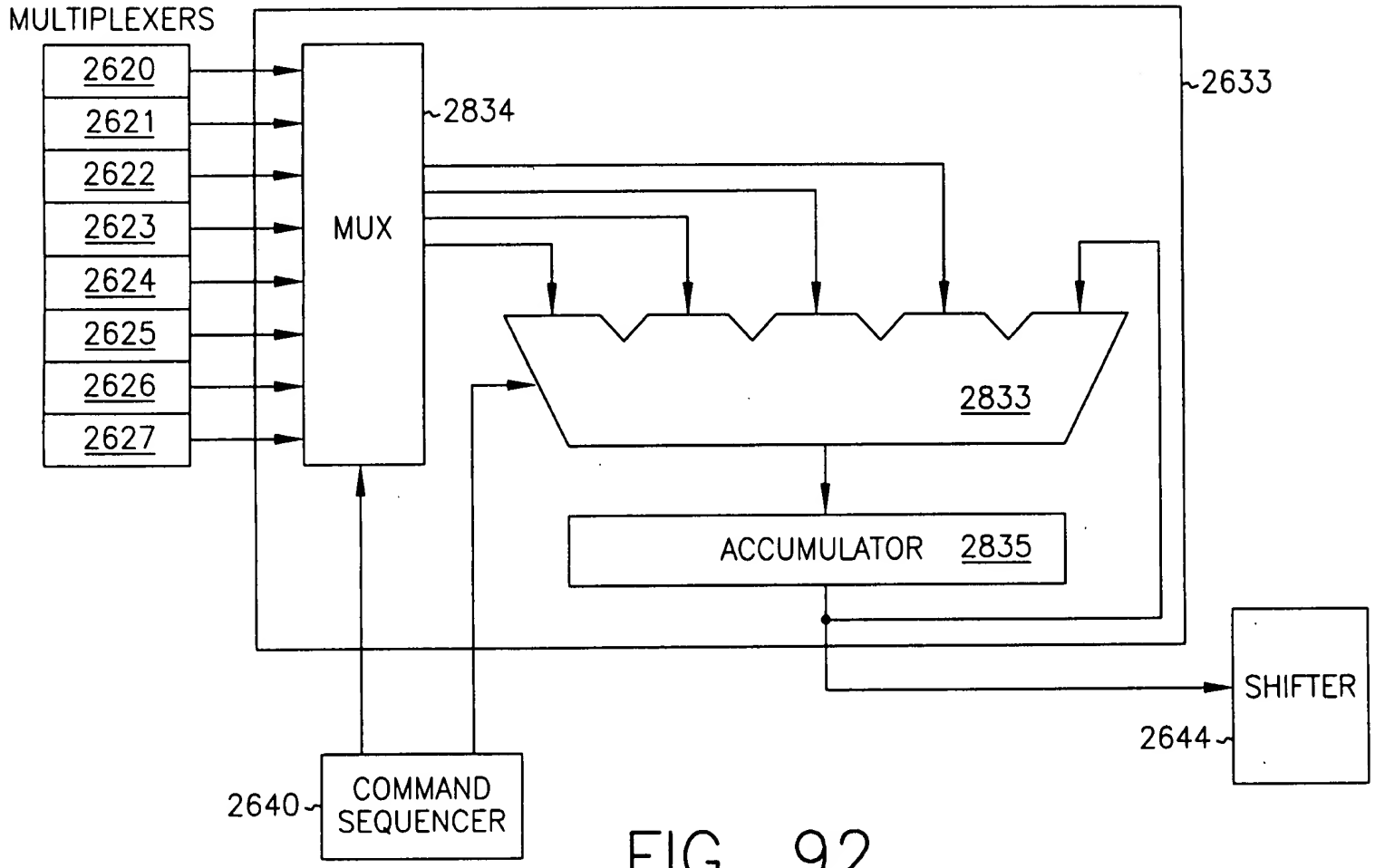

MULTIPLEXERS
2620
2621
2622
2623
2624
2625
2626
2627
MUX
2834
2633
2833
ACCUMULATOR 2835
SHIFTER
2644
2640
COMMAND SEQUENCER

FIG. 92

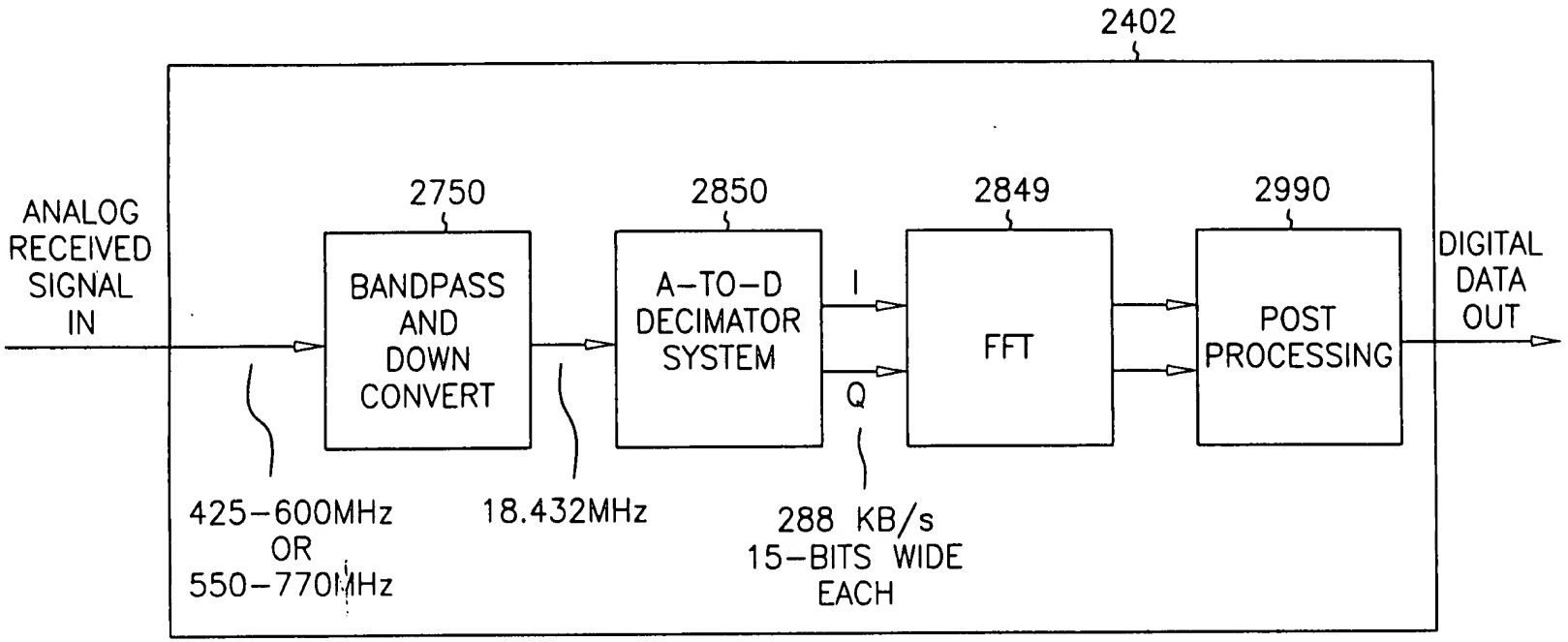

2402
ANALOG RECEIVED SIGNAL IN
2750
BANDPASS AND DOWN CONVERT
2850
A-TO-D DECIMATOR SYSTEM
I
Q
2849
FFT
2990
POST PROCESSING
DIGITAL DATA OUT
425-600MHz OR 550-770MHz
18.432MHz
288 KB/s 15-BITS WIDE EACH

FIG. 93

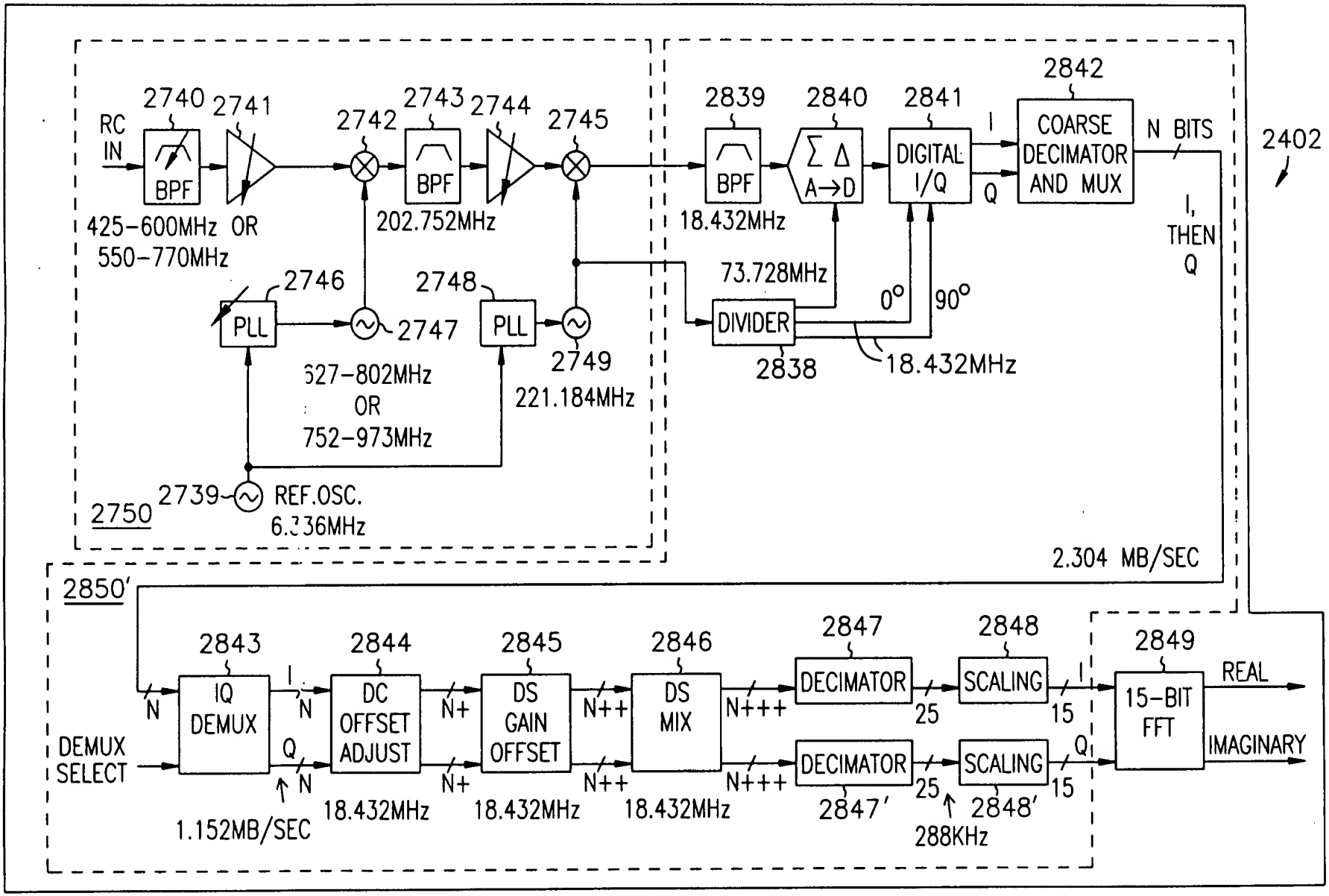

RC IN
2740
2741
2742
2743
2744
2745
BPF
425–600MHz OR
550–770MHz
202.752MHz
2746
2747
2748
2749
PLL
PLL
527–802MHz
OR
752–973MHz
221.184MHz
2739
REF.OSC.
6.336MHz
2750
2839
2840
2841
2842
BPF
18.432MHz
Σ Δ
A→D
DIGITAL
I/Q
I
Q
COARSE
DECIMATOR
AND MUX
N BITS
I,
THEN
Q
2402
73.728MHz
DIVIDER
2838
0°
90°
18.432MHz
2.304 MB/SEC
2850'
2843
2844
2845
2846
2847
2848
2849
IQ
DEMUX
DC
OFFSET
ADJUST
DS
GAIN
OFFSET
DS
MIX
DECIMATOR
SCALING
15-BIT
FFT
REAL
IMAGINARY
DEMUX
SELECT
N
I
Q
N+
N++
N+++
25
15
2847'
2848'
1.152MB/SEC
18.432MHz
18.432MHz
18.432MHz
288KHz

FIG. 94

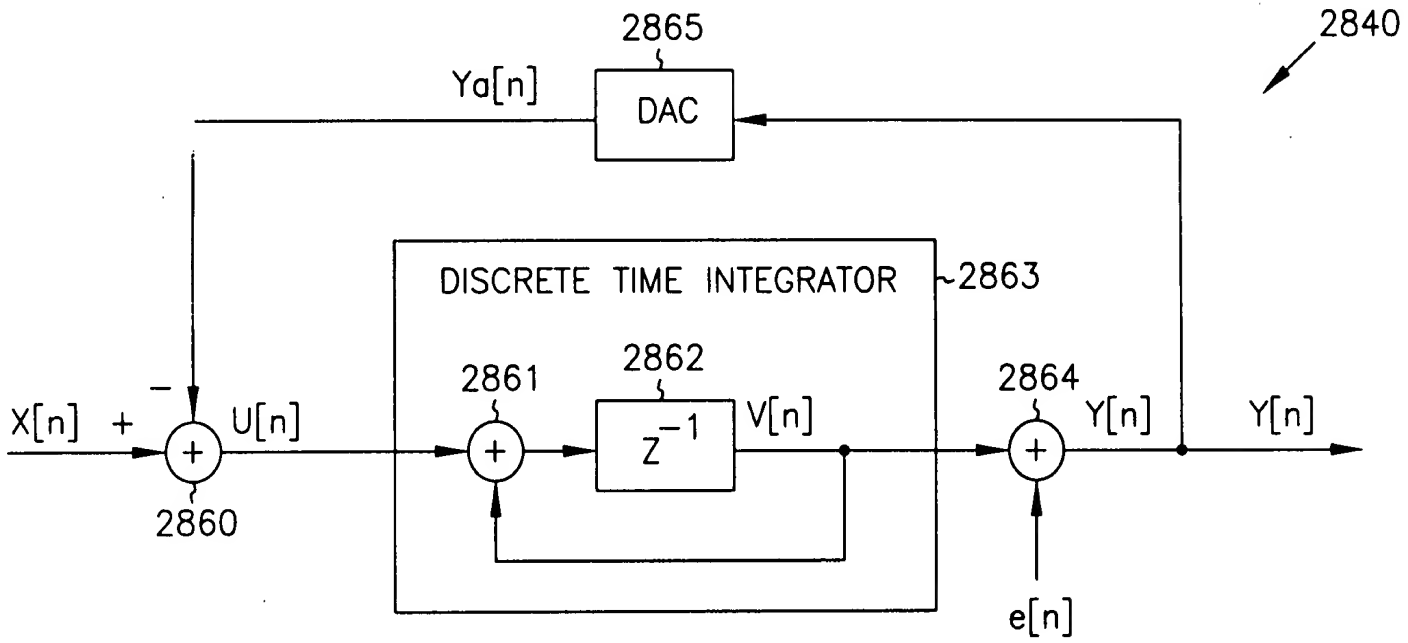

2865
2840
Ya[n]
DAC
DISCRETE TIME INTEGRATOR
2863
2862
2861
2864
X[n]
+
−
U[n]
V[n]
Y[n]
Y[n]
Z^{-1}
2860
e[n]

FIG. 95

TD6020 "HZETD660

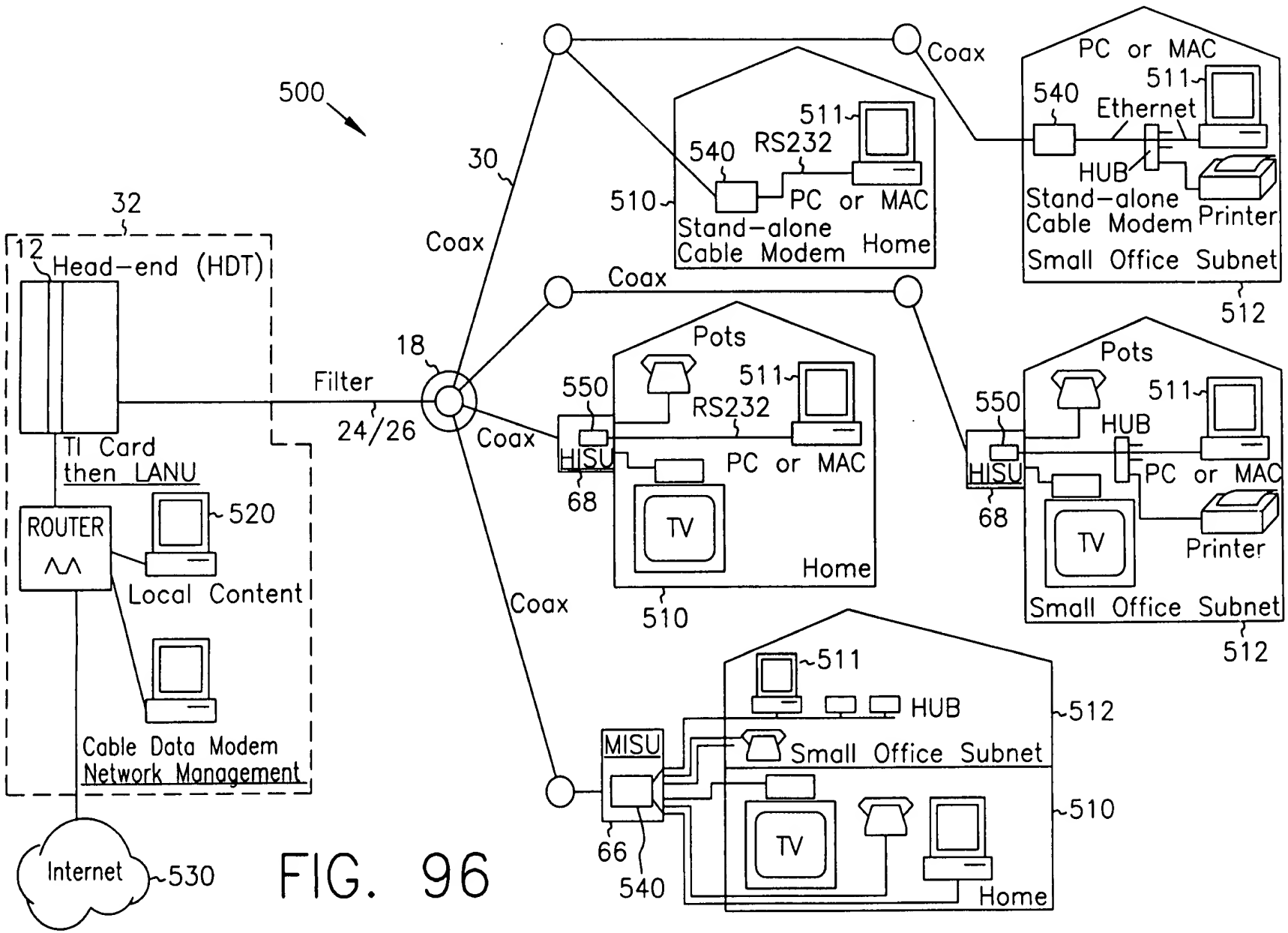


FIG. 96

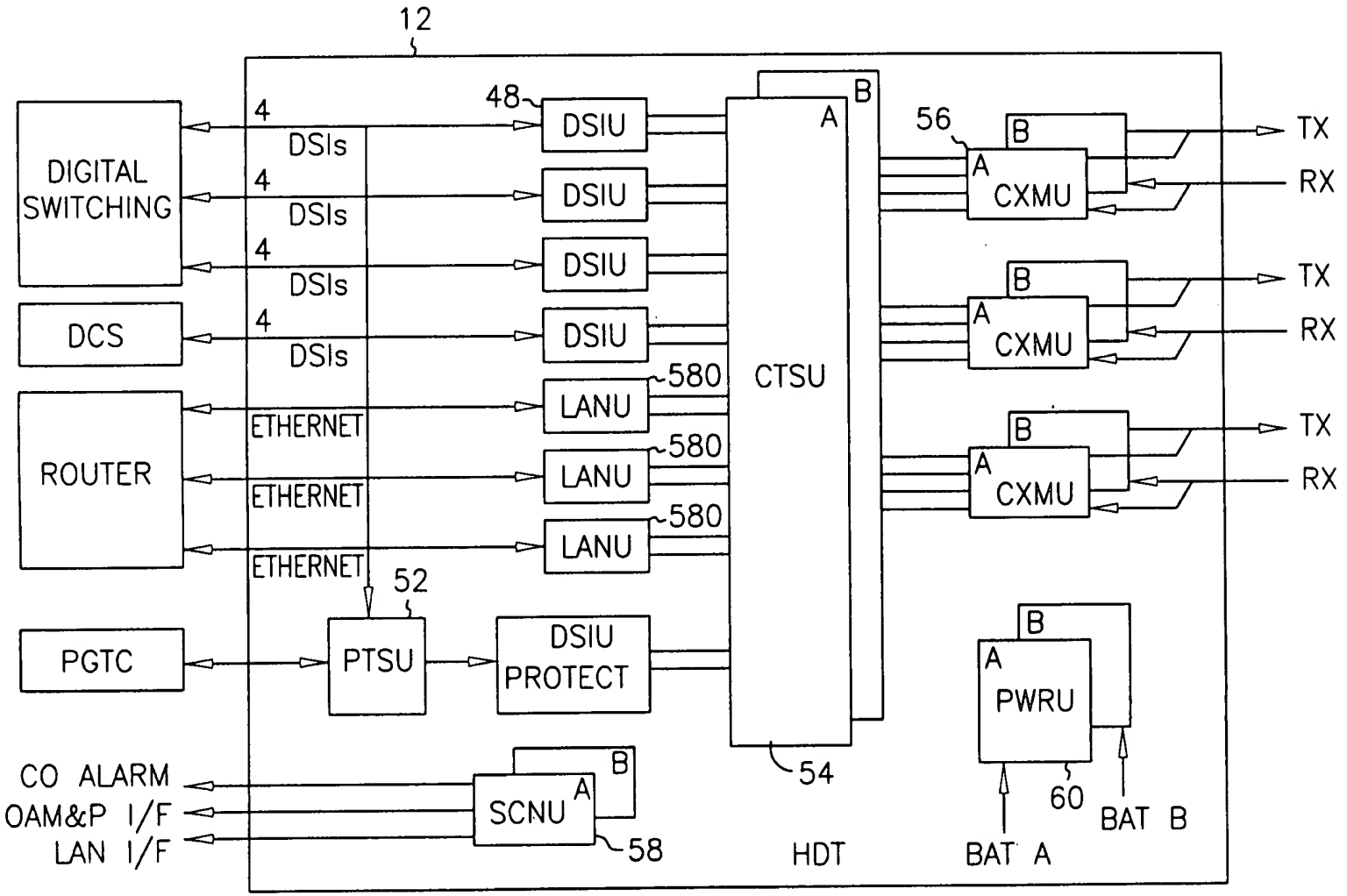

12
DIGITAL SWITCHING
DCS
ROUTER
PGTC
CO ALARM
OAM&P I/F
LAN I/F
4 DSIs
4 DSIs
4 DSIs
4 DSIs
ETHERNET
ETHERNET
ETHERNET
48
DSIU
DSIU
DSIU
DSIU
LANU
LANU
LANU
580
580
580
52
PTSU
DSIU PROTECT
SCNU
58
A
B
CTSU
54
HDT
56
CXMU
CXMU
CXMU
TX
RX
TX
RX
TX
RX
PWRU
60
BAT A
BAT B

FIG. 97

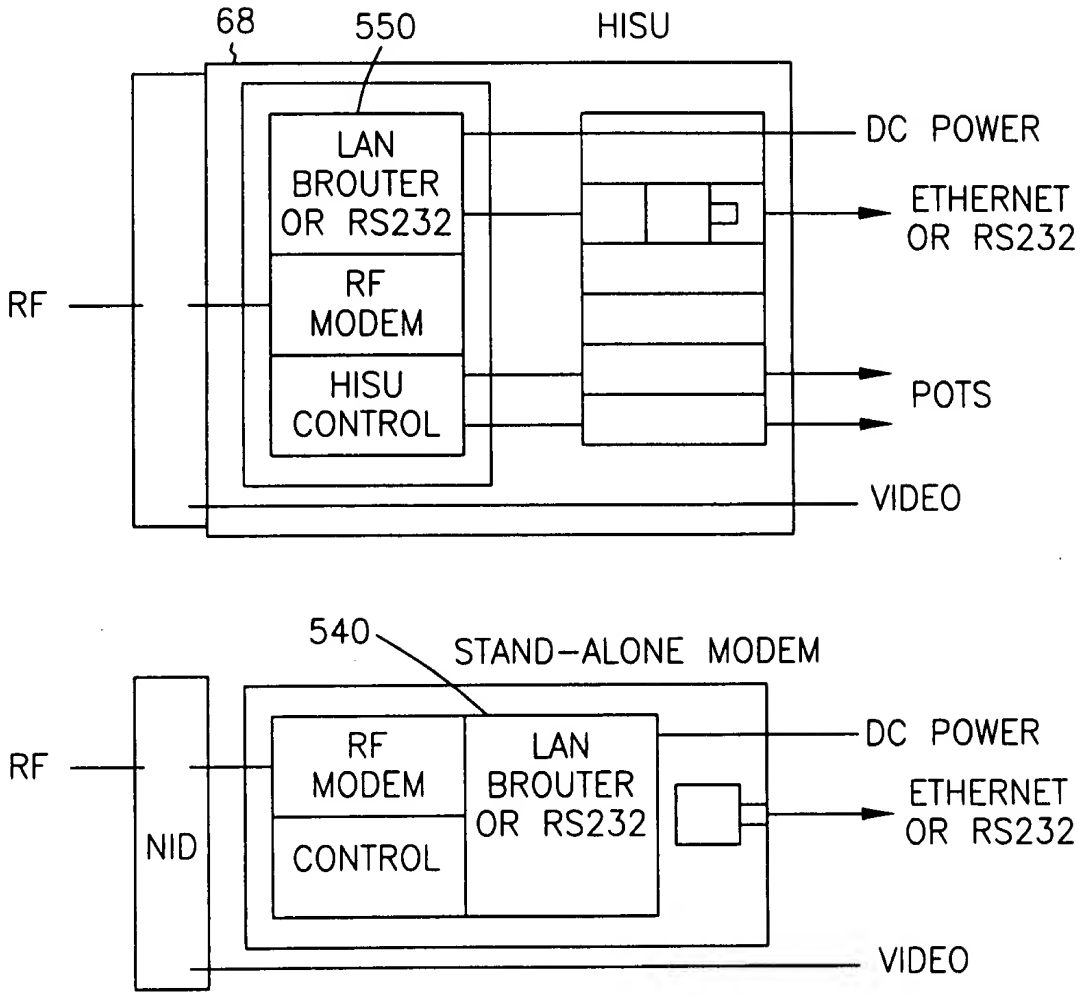

68
550
HISU
LAN
BROUTER
OR RS232
RF
MODEM
HISU
CONTROL
RF
DC POWER
ETHERNET
OR RS232
POTS
VIDEO
540
STAND-ALONE MODEM
RF
NID
RF
MODEM
CONTROL
LAN
BROUTER
OR RS232
DC POWER
ETHERNET
OR RS232
VIDEO

FIG. 98

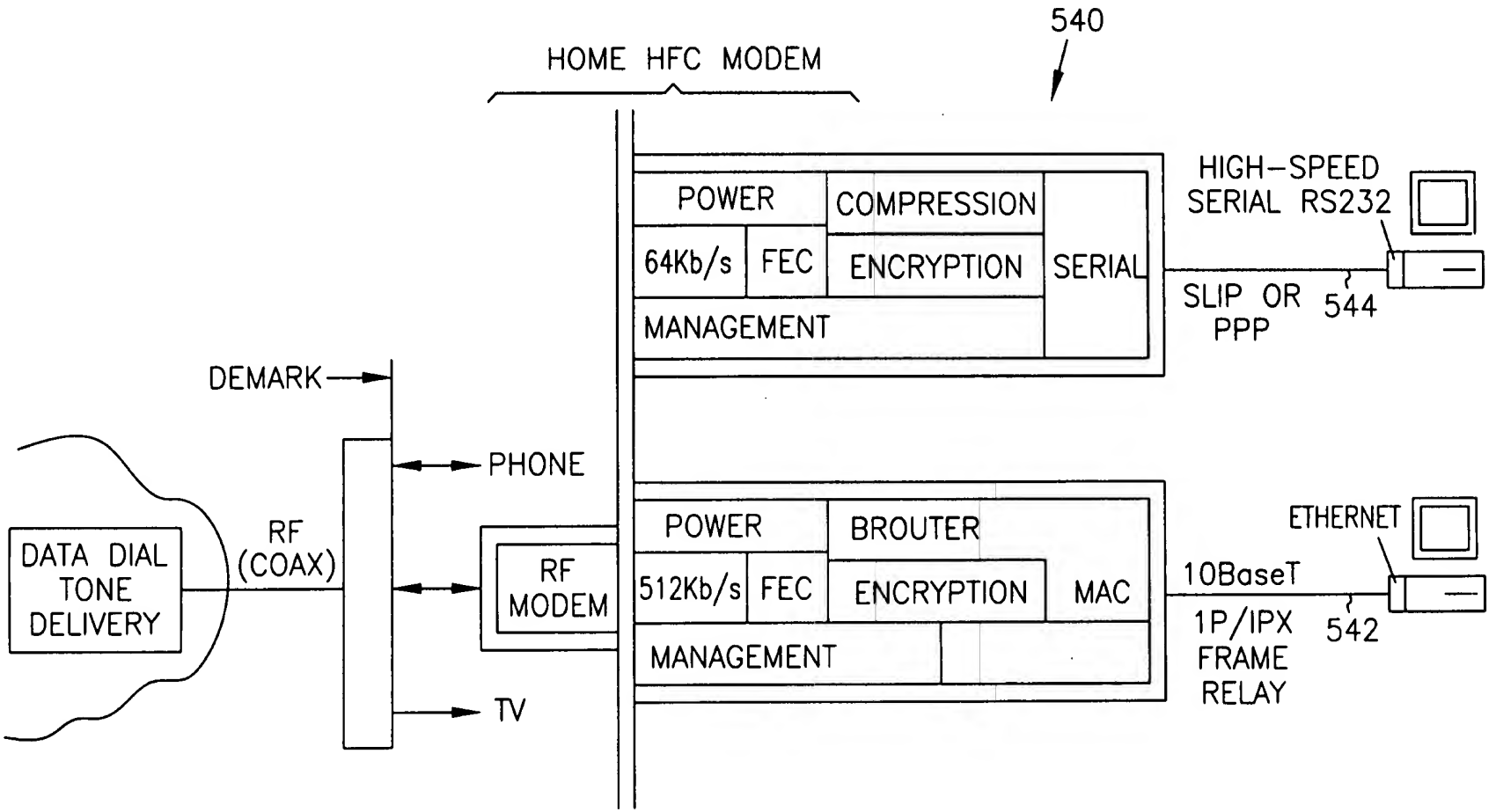

540
HOME HFC MODEM
POWER
COMPRESSION
64Kb/s
FEC
ENCRYPTION
SERIAL
MANAGEMENT
HIGH-SPEED SERIAL RS232
SLIP OR PPP
544
DEMARK
PHONE
DATA DIAL TONE DELIVERY
RF (COAX)
RF MODEM
POWER
BROUTER
512Kb/s
FEC
ENCRYPTION
MAC
MANAGEMENT
ETHERNET
10BaseT
1P/IPX FRAME RELAY
542
TV

FIG. 99

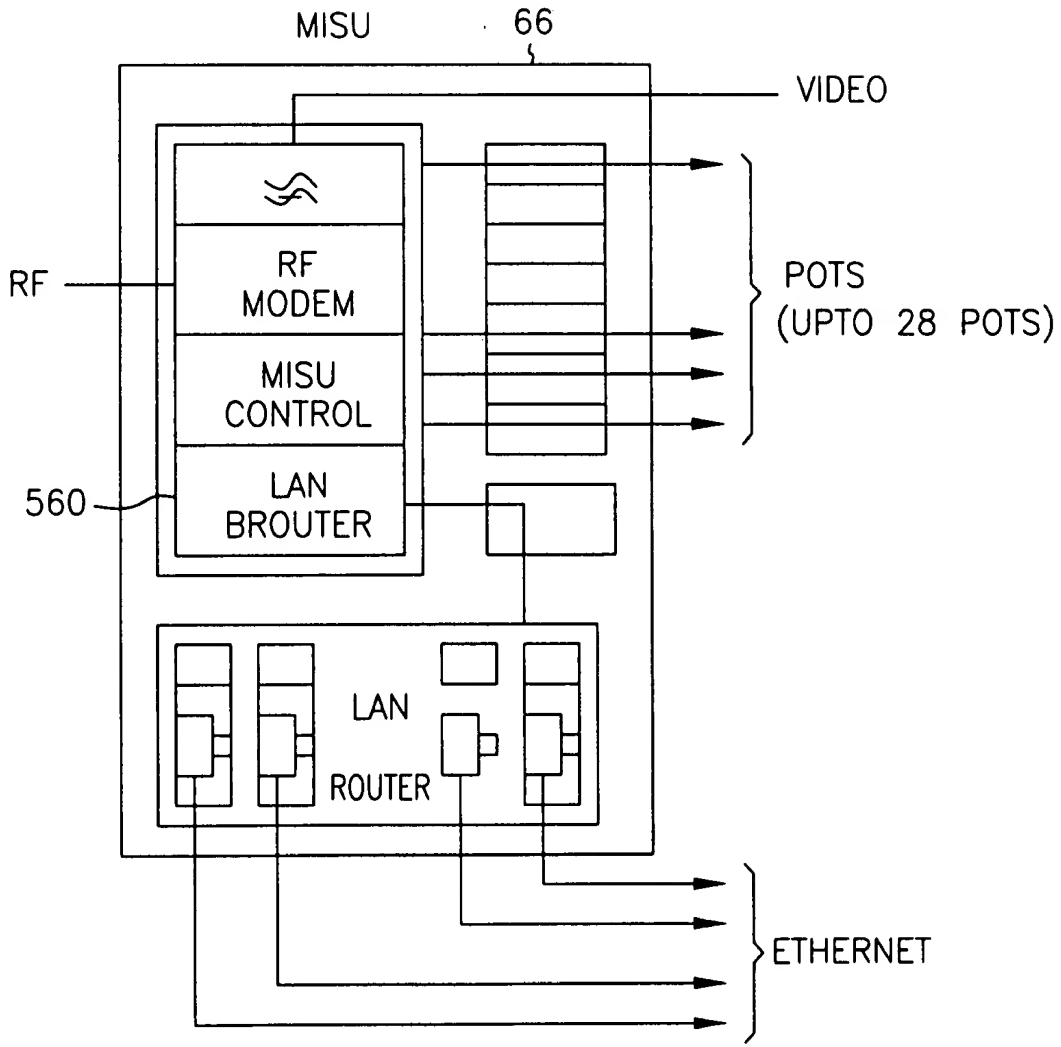

MISU
66
VIDEO
RF
RF MODEM
MISU CONTROL
LAN BROUTER
560
POTS
(UPTO 28 POTS)
LAN
ROUTER
ETHERNET

FIG. 100

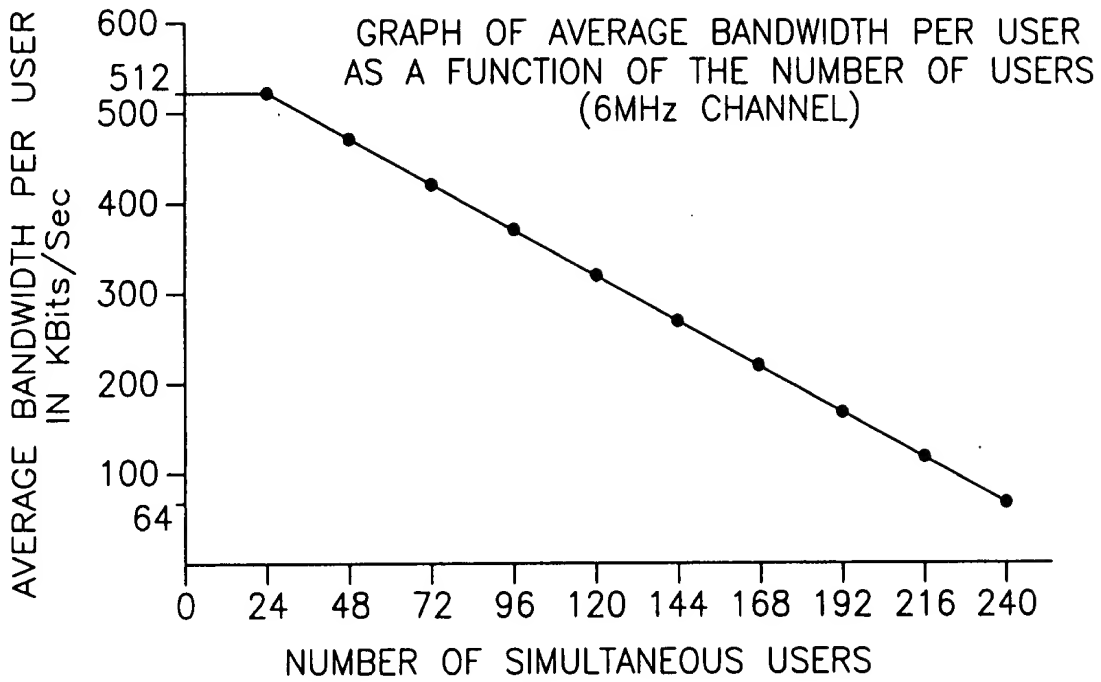

GRAPH OF AVERAGE BANDWIDTH PER USER
AS A FUNCTION OF THE NUMBER OF USERS
(6MHz CHANNEL)
AVERAGE BANDWIDTH PER USER
IN KBits/Sec
600
512
500
400
300
200
100
64
0
24
48
72
96
120
144
168
192
216
240
NUMBER OF SIMULTANEOUS USERS

FIG. 101

T06020"+27T0660

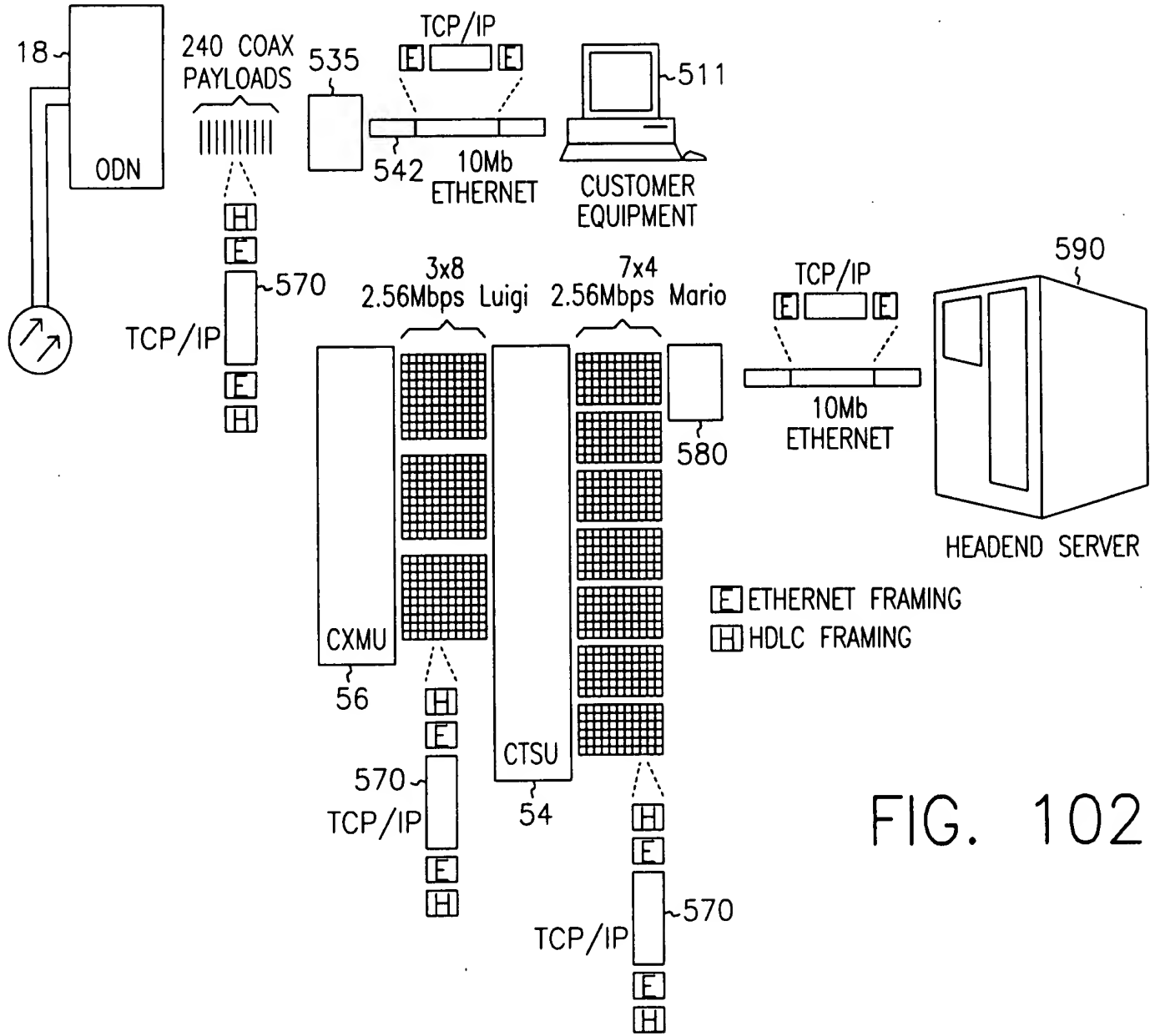


FIG. 102

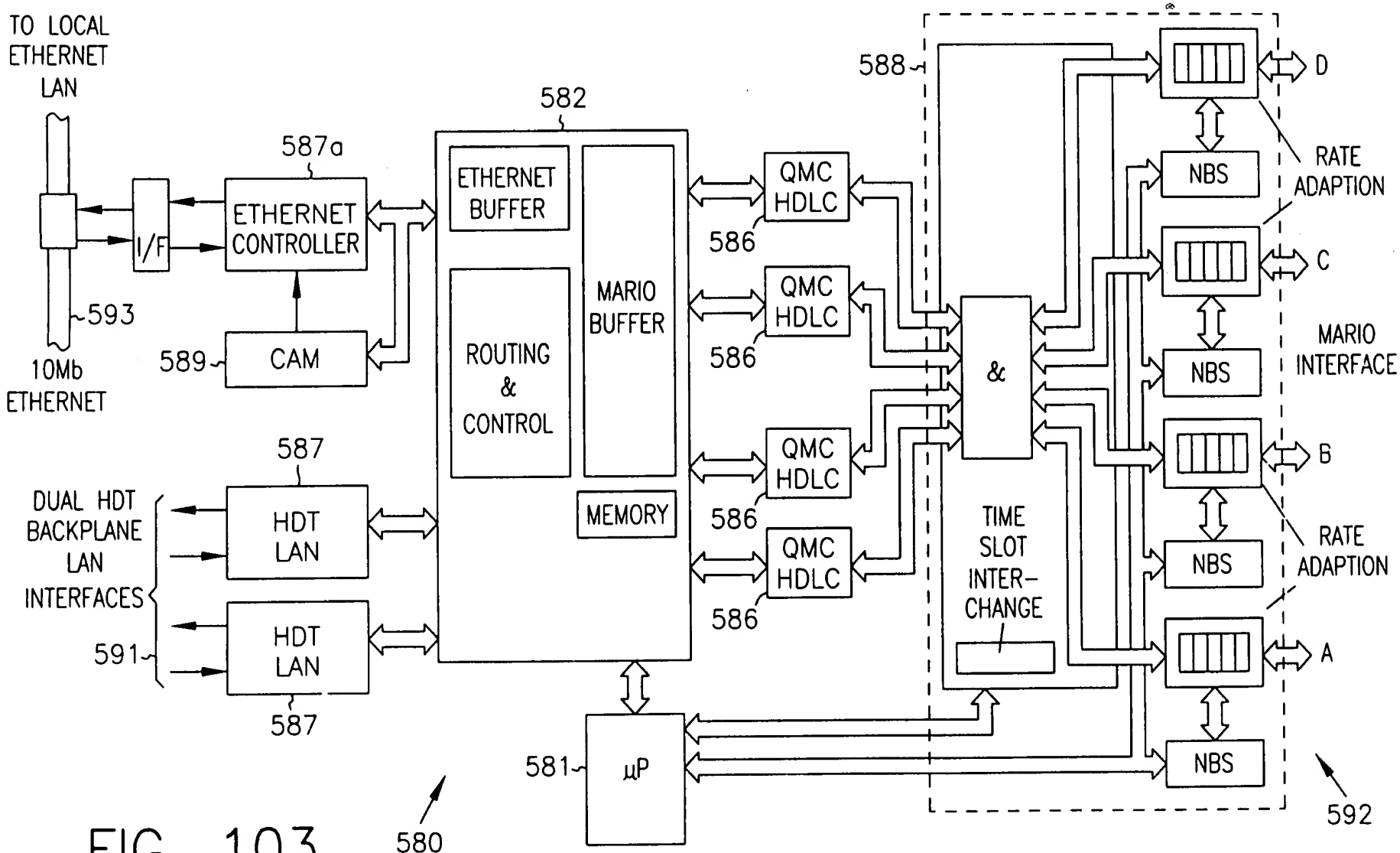

TO LOCAL ETHERNET LAN
10Mb ETHERNET
593
I/F
587a
ETHERNET CONTROLLER
589
CAM
582
ETHERNET BUFFER
ROUTING & CONTROL
MARIO BUFFER
MEMORY
587
DUAL HDT BACKPLANE LAN INTERFACES
591
HDT LAN
HDT LAN
587
581
µP
580
QMC HDLC
QMC HDLC
QMC HDLC
QMC HDLC
586
586
586
586
588
&
TIME SLOT INTER-CHANGE
NBS
NBS
NBS
NBS
RATE ADAPTION
RATE ADAPTION
MARIO INTERFACE
D
C
B
A
592

FIG. 103

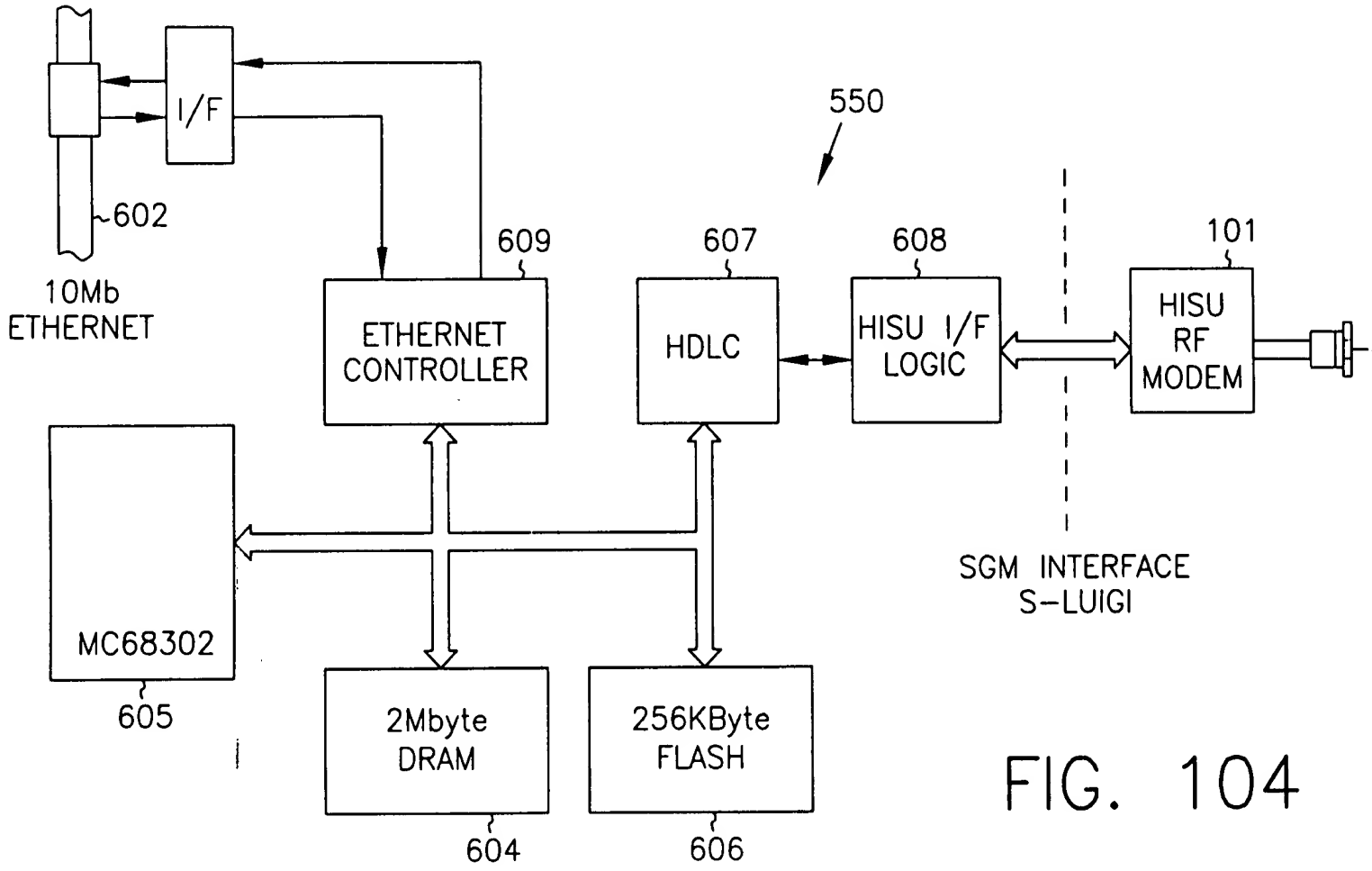

I/F
602
10Mb
ETHERNET
609
ETHERNET
CONTROLLER
550
607
HDLC
608
HISU I/F
LOGIC
101
HISU
RF
MODEM
SGM INTERFACE
S-LUIGI
MC68302
605
2Mbyte
DRAM
604
256KByte
FLASH
606

FIG. 104

T6020 "ZETO660

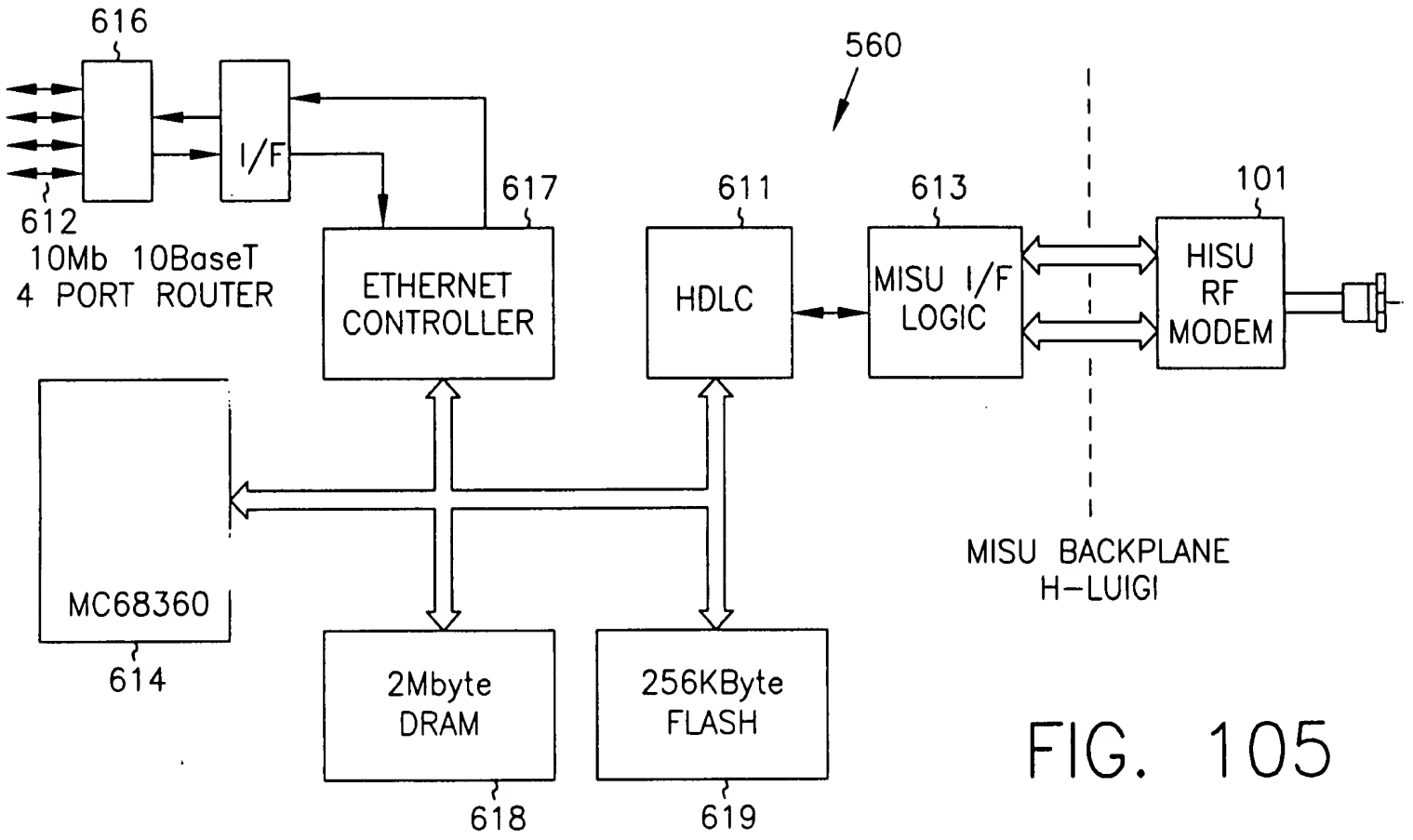


FIG. 105

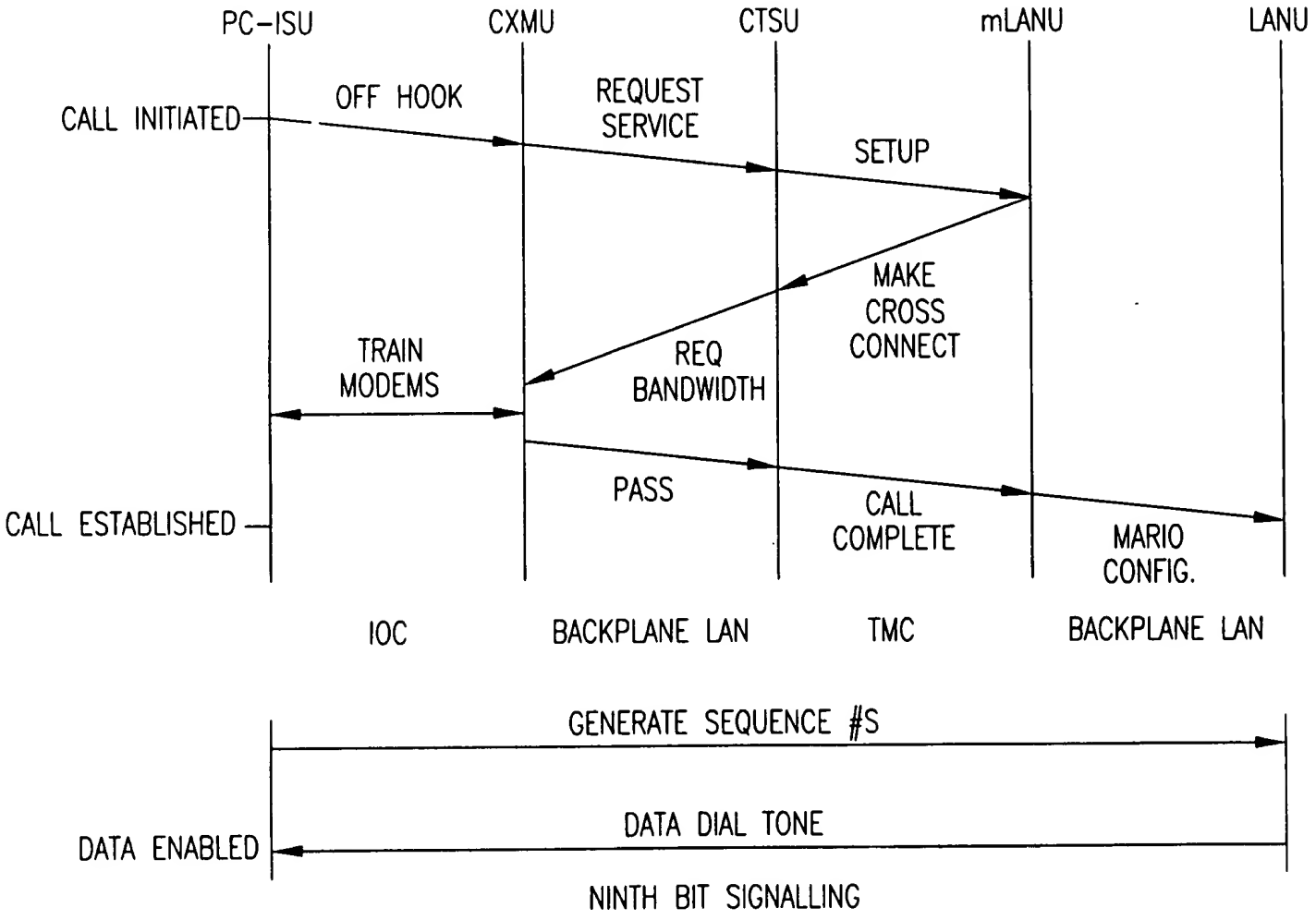

PC-ISU
CXMU
CTSU
mLANU
LANU
CALL INITIATED
OFF HOOK
REQUEST SERVICE
SETUP
MAKE CROSS CONNECT
TRAIN MODEMS
REQ BANDWIDTH
PASS
CALL ESTABLISHED
CALL COMPLETE
MARIO CONFIG.
IOC
BACKPLANE LAN
TMC
BACKPLANE LAN
GENERATE SEQUENCE #S
DATA ENABLED
DATA DIAL TONE
NINTH BIT SIGNALLING

FIG. 106

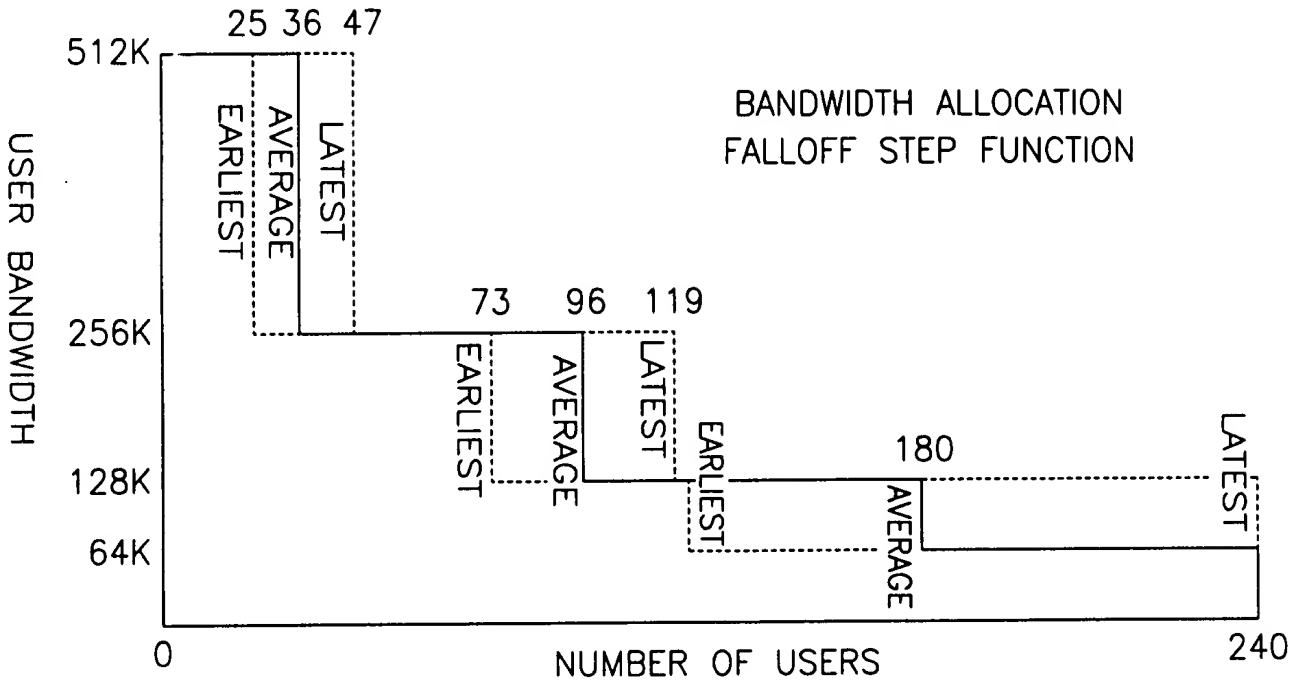
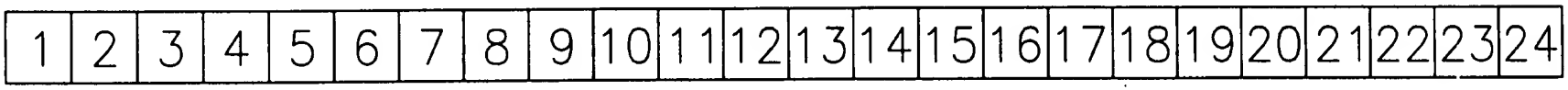
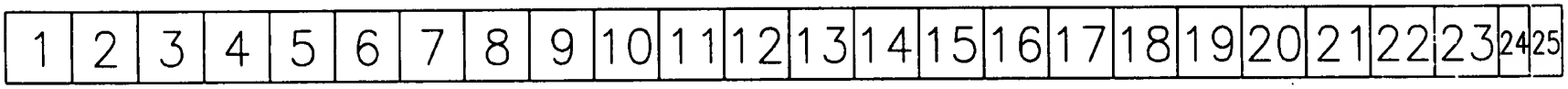

BANDWIDTH ALLOCATION
FALLOFF STEP FUNCTION
USER BANDWIDTH
512K
256K
128K
64K
0
25 36 47
73 96 119
180
240
EARLIEST
AVERAGE
LATEST
NUMBER OF USERS

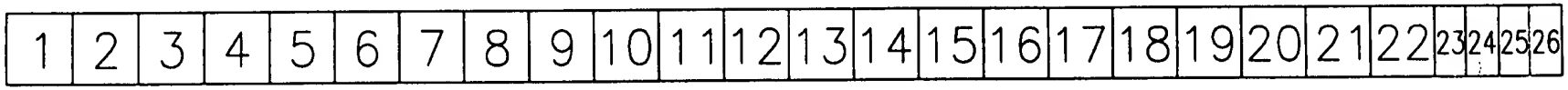
FIG. 107



THE RF SPECTRUM OF 24 USERS WITH 512Kbs



ADDING THE 25th USER



ADDING THE 26th USER, ETC

FIG. 108

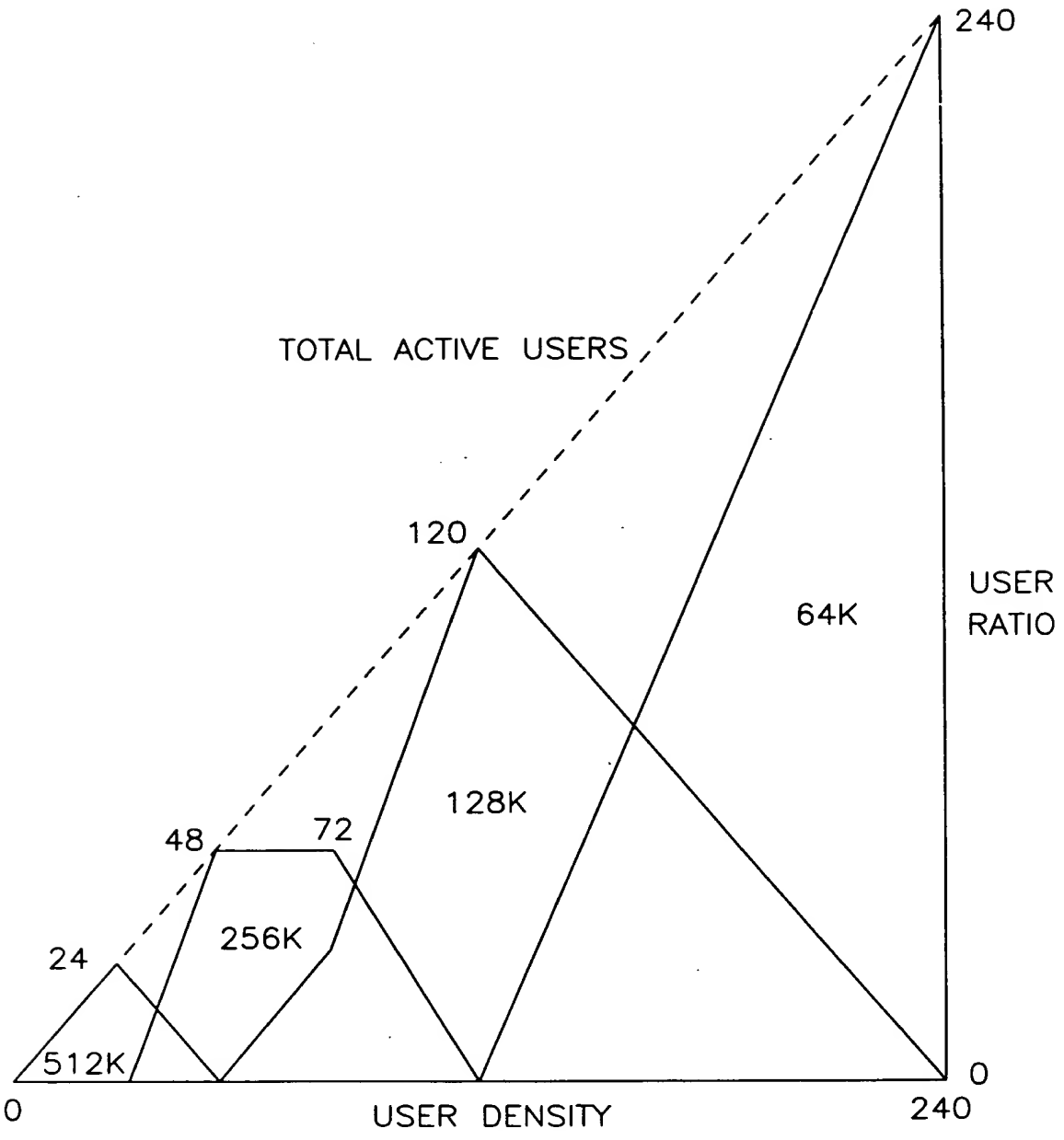

240
TOTAL ACTIVE USERS
120
USER
RATIO
64K
128K
48
72
256K
24
512K
0
0
USER DENSITY
240

FIG. 109

T06020"h2ET0660

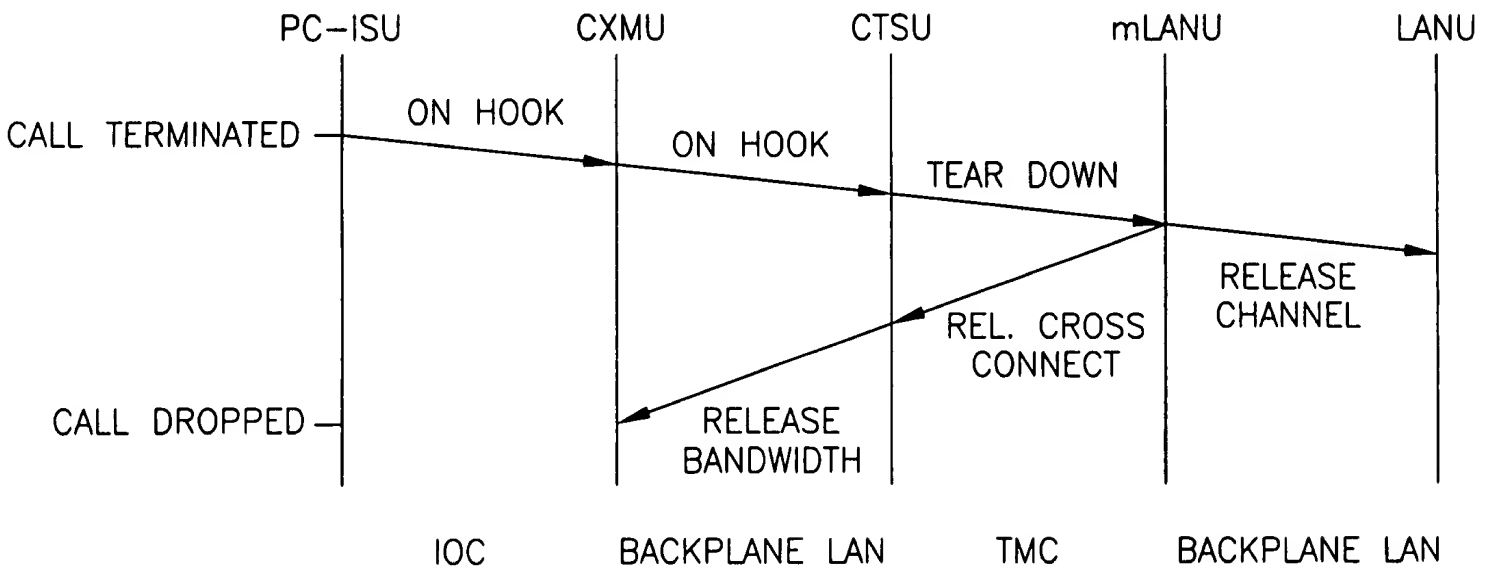


FIG. 110

T06020" h2ET0660

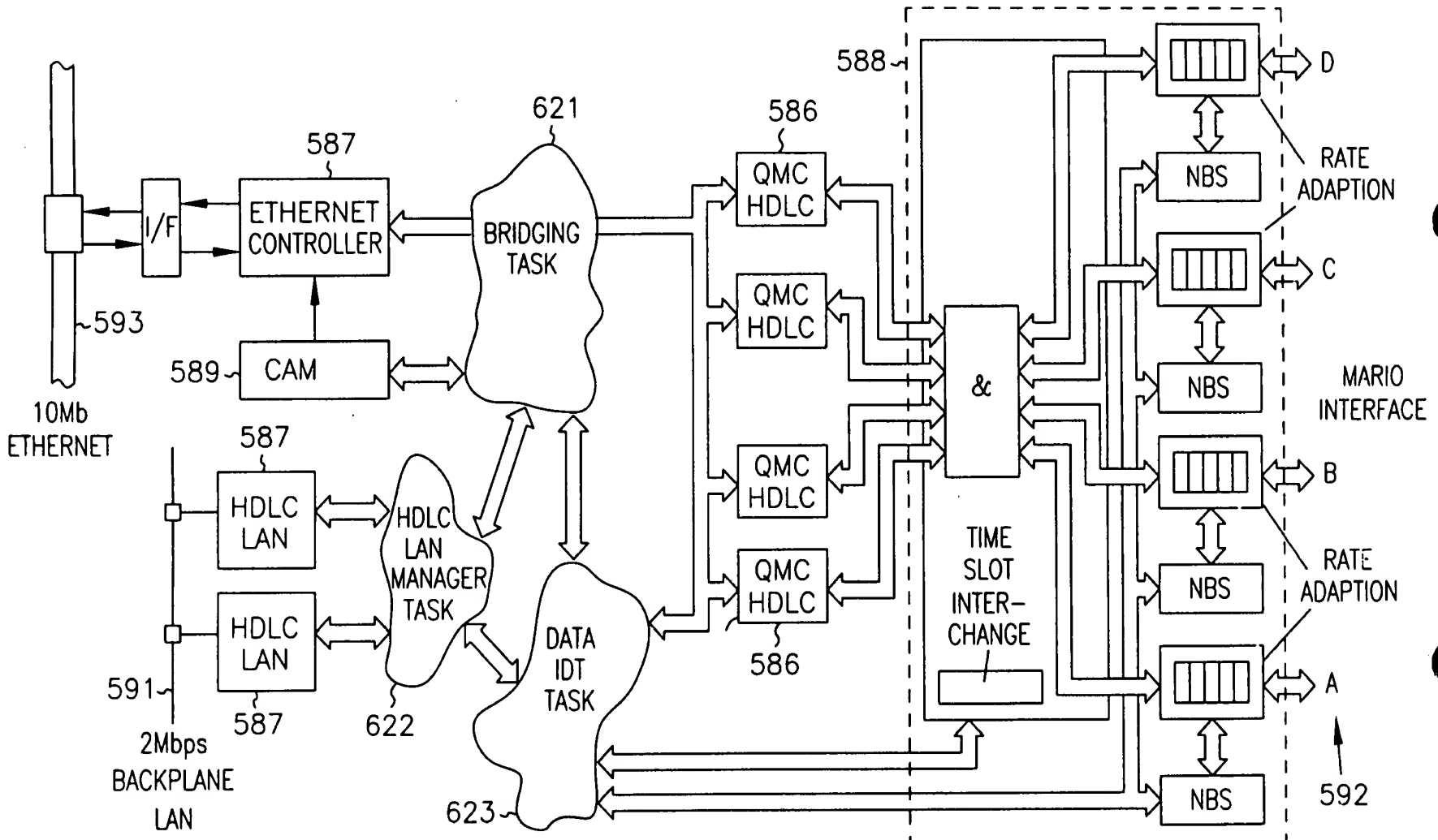


FIG. 111

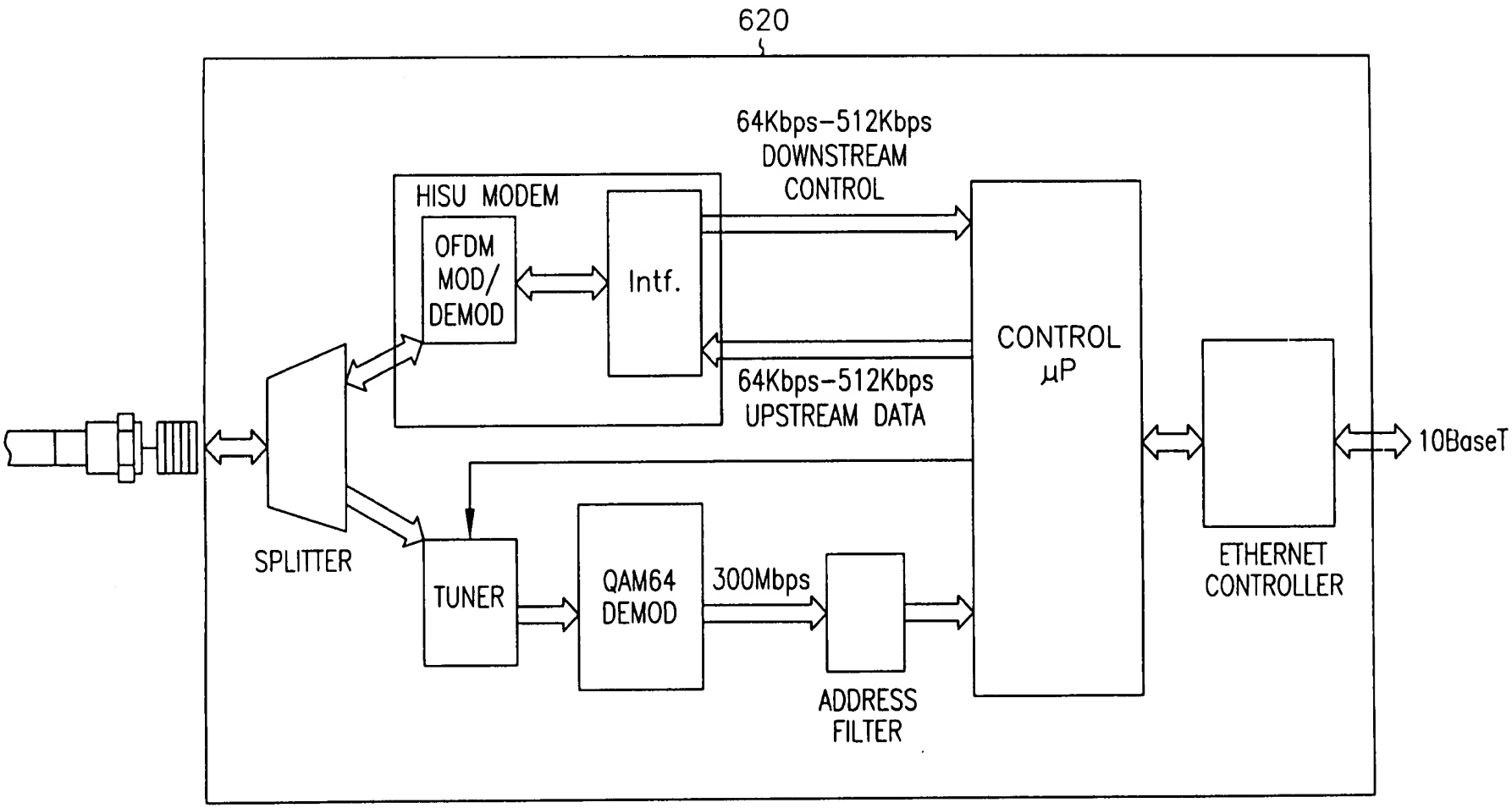

620
64Kbps-512Kbps
DOWNSTREAM
CONTROL
HISU MODEM
OFDM
MOD/
DEMOD
Intf.
CONTROL
μP
64Kbps-512Kbps
UPSTREAM DATA
10BaseT
SPLITTER
TUNER
QAM64
DEMOD
300Mbps
ETHERNET
CONTROLLER
ADDRESS
FILTER

FIG. 112

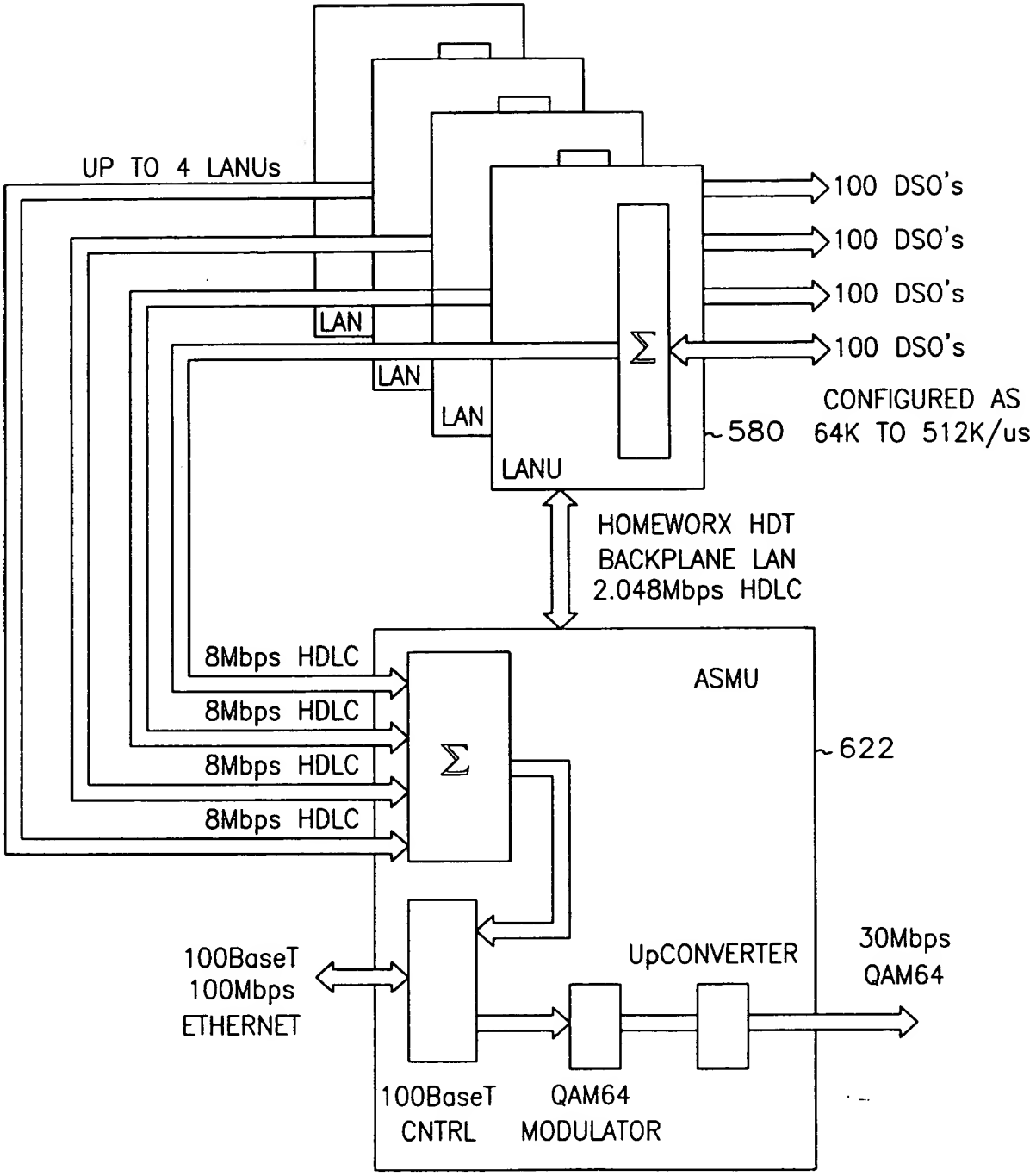

UP TO 4 LANUs
100 DSO's
100 DSO's
100 DSO's
100 DSO's
LAN
LAN
LAN
LANU
Σ
CONFIGURED AS
64K TO 512K/us
~580
HOMEWORX HDT
BACKPLANE LAN
2.048Mbps HDLC
8Mbps HDLC
8Mbps HDLC
8Mbps HDLC
8Mbps HDLC
Σ
ASMU
~622
100BaseT
100Mbps
ETHERNET
UpCONVERTER
30Mbps
QAM64
100BaseT
CNTRL
QAM64
MODULATOR

FIG. 113

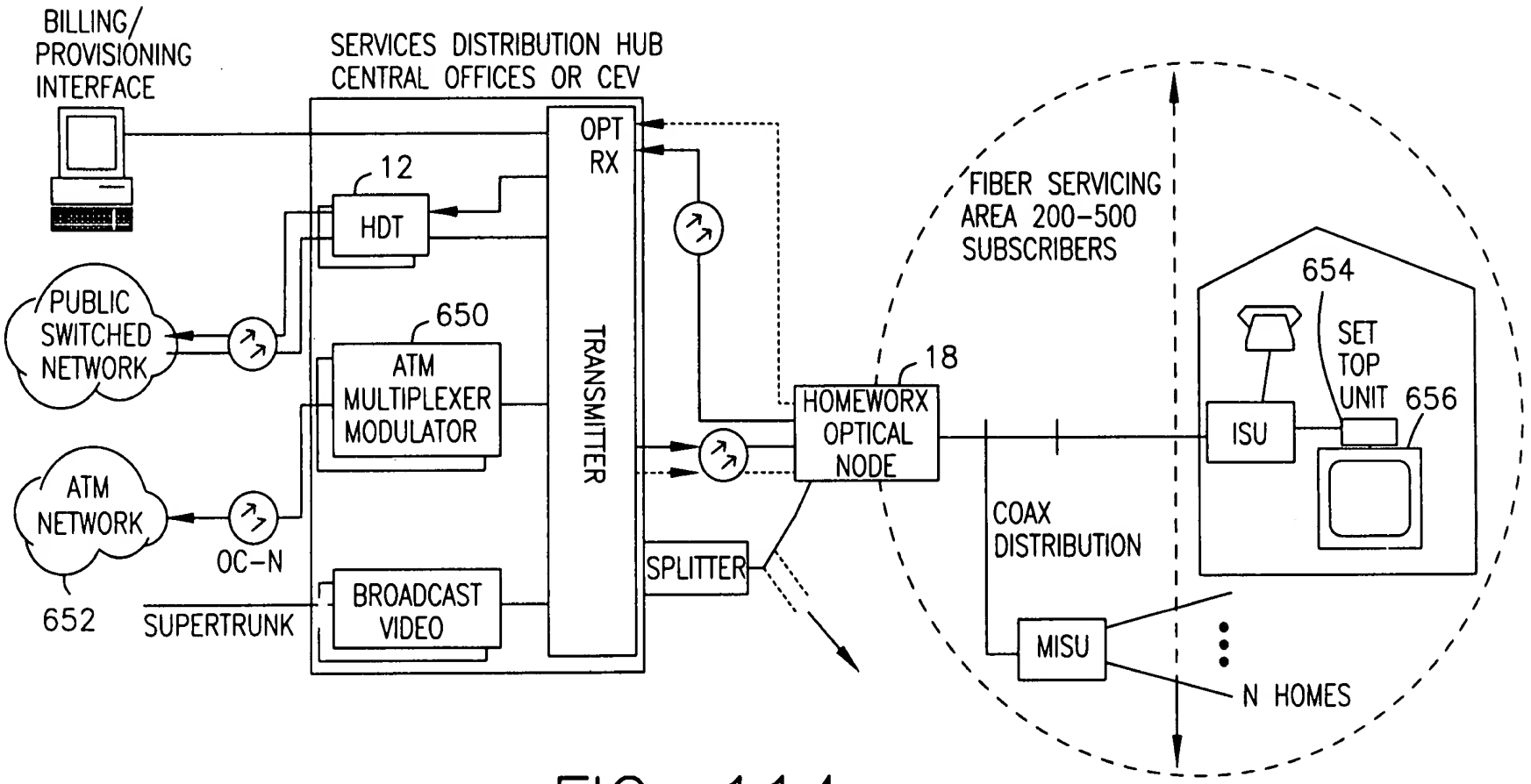

BILLING/
PROVISIONING
INTERFACE
SERVICES DISTRIBUTION HUB
CENTRAL OFFICES OR CEV
12
HDT
OPT
RX
TRANSMITTER
650
ATM
MULTIPLEXER
MODULATOR
PUBLIC
SWITCHED
NETWORK
ATM
NETWORK
OC-N
652
SUPERTRUNK
BROADCAST
VIDEO
SPLITTER
18
HOMEWORX
OPTICAL
NODE
FIBER SERVICING
AREA 200-500
SUBSCRIBERS
654
SET
TOP
UNIT
656
ISU
COAX
DISTRIBUTION
MISU
N HOMES

FIG. 114

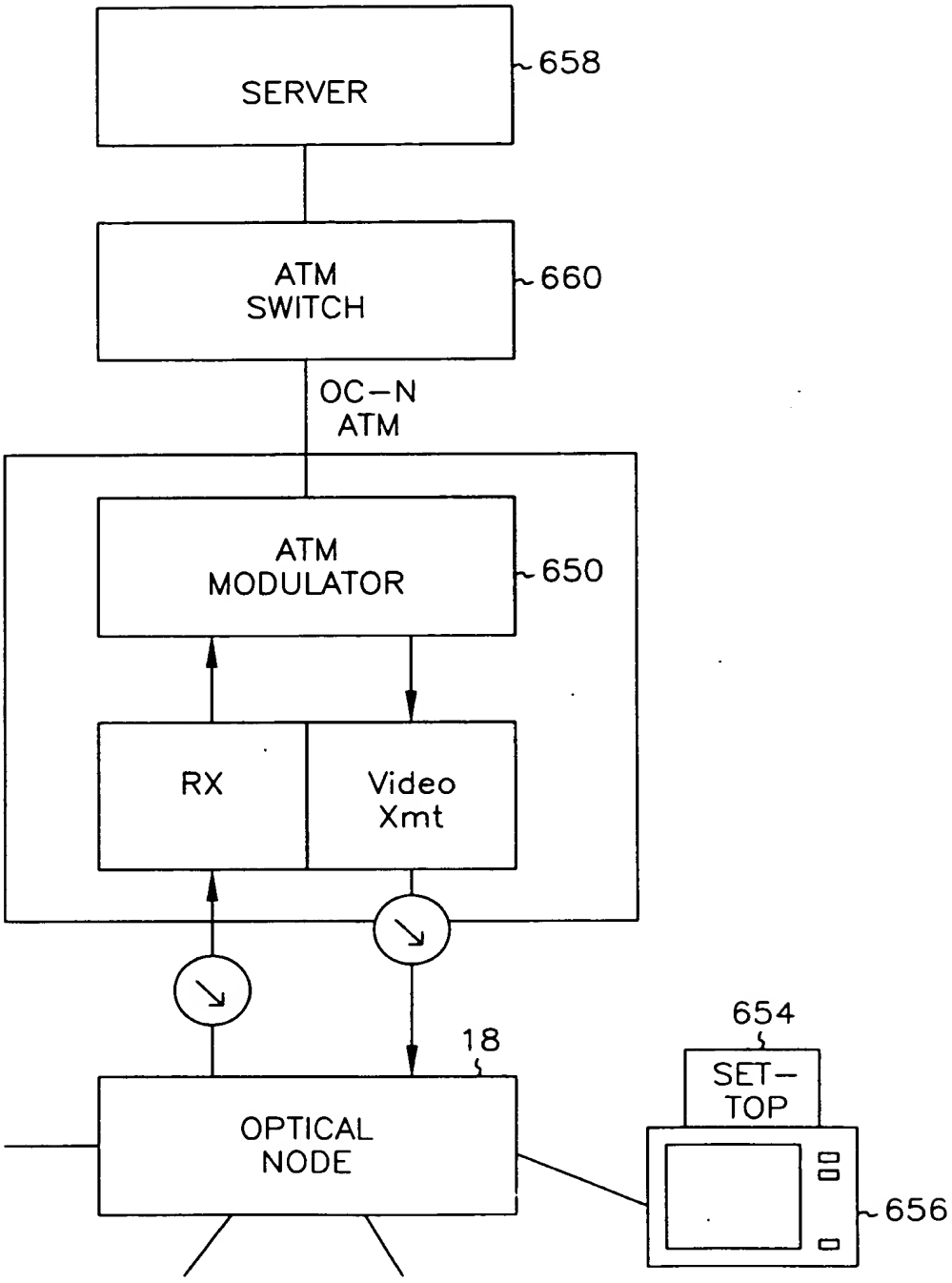

SERVER
658
ATM
SWITCH
660
OC–N
ATM
ATM
MODULATOR
650
RX
Video
Xmt
18
654
SET–
TOP
OPTICAL
NODE
656

FIG. 115

T06020"h2ET0660

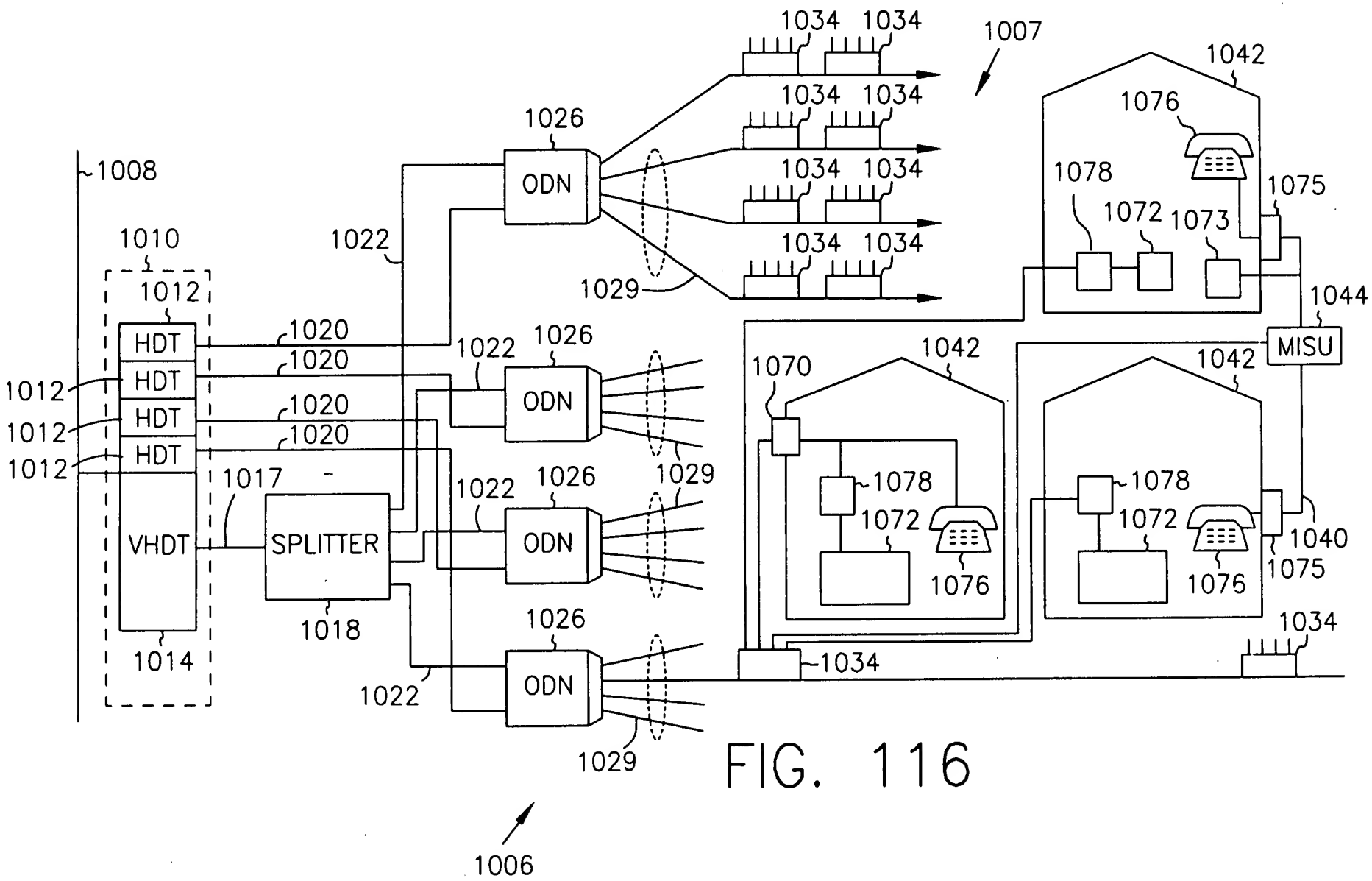


FIG. 116

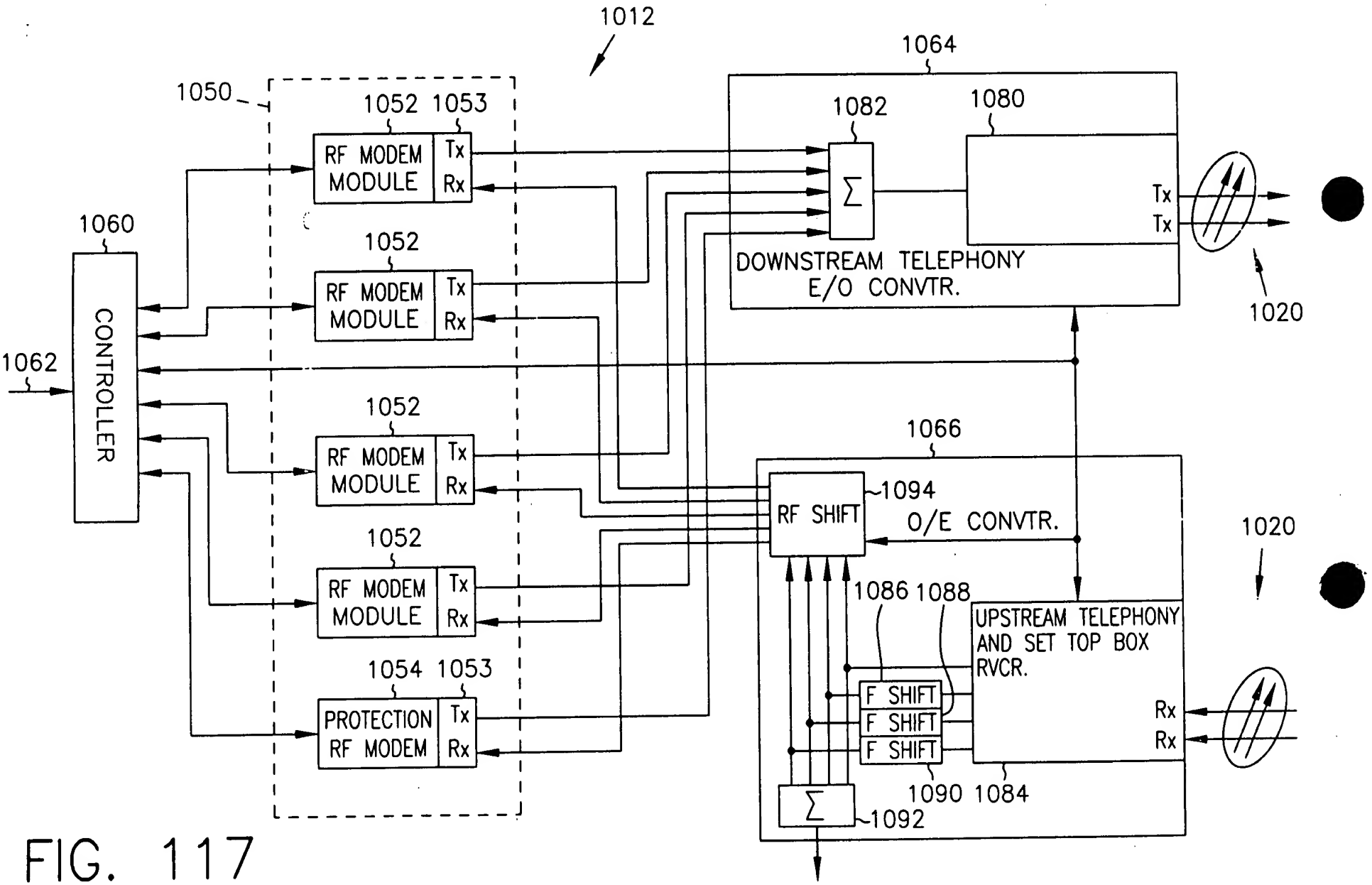

1012
1064
1050
1052 1053
1082
1080
RF MODEM MODULE
Tx
Rx
Σ
Tx
Tx
DOWNSTREAM TELEPHONY E/O CONVTR.
1020
1060
1052
CONTROLLER
1062
1052
1066
1094
RF SHIFT
O/E CONVTR.
1020
1052
1086 1088
UPSTREAM TELEPHONY AND SET TOP BOX RVCR.
1054 1053
PROTECTION RF MODEM
F SHIFT
F SHIFT
F SHIFT
Rx
Rx
1090 1084
Σ
1092

FIG. 117

TD6020"+2ETD660

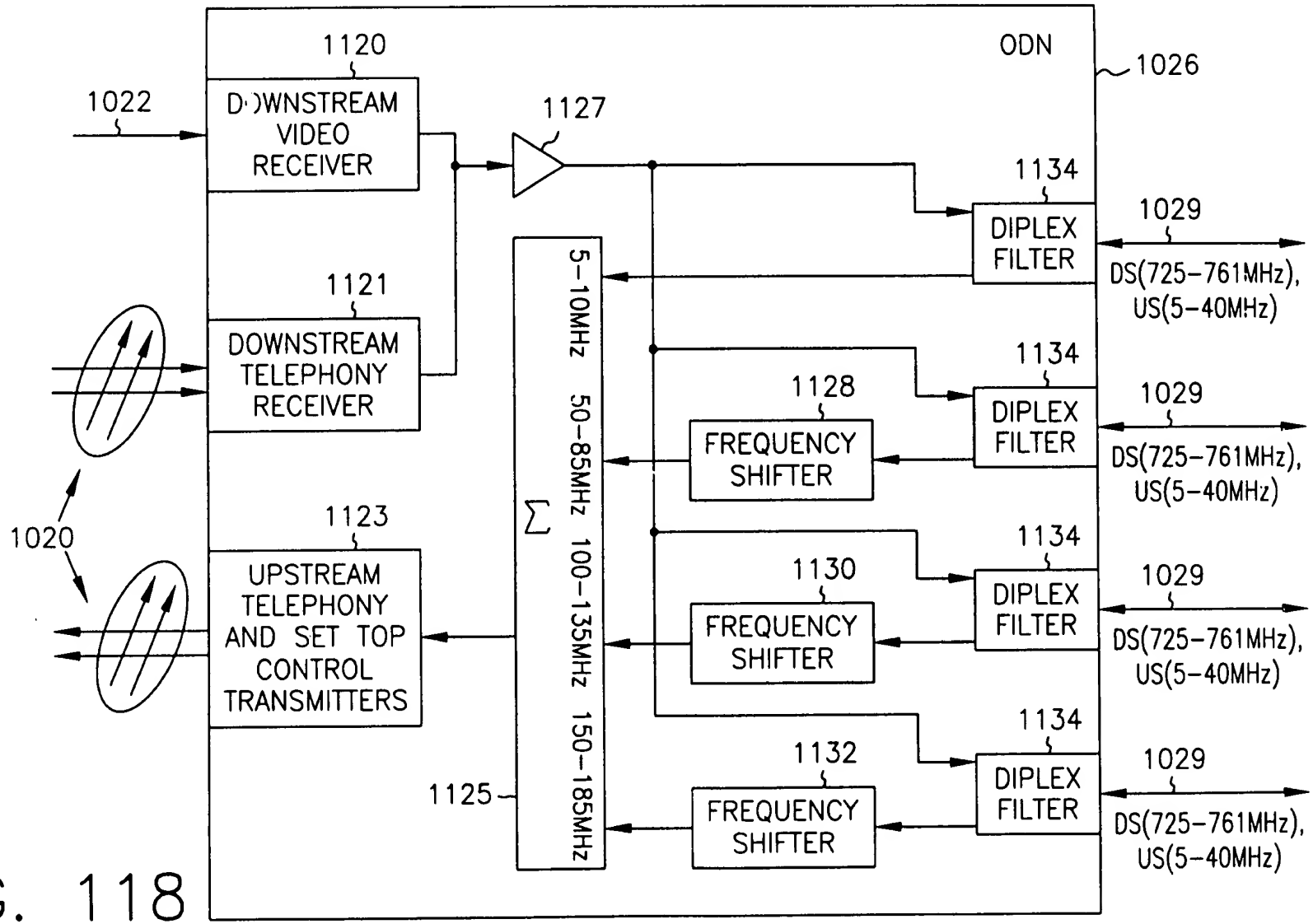


FIG. 118

T06020"+2ET0660

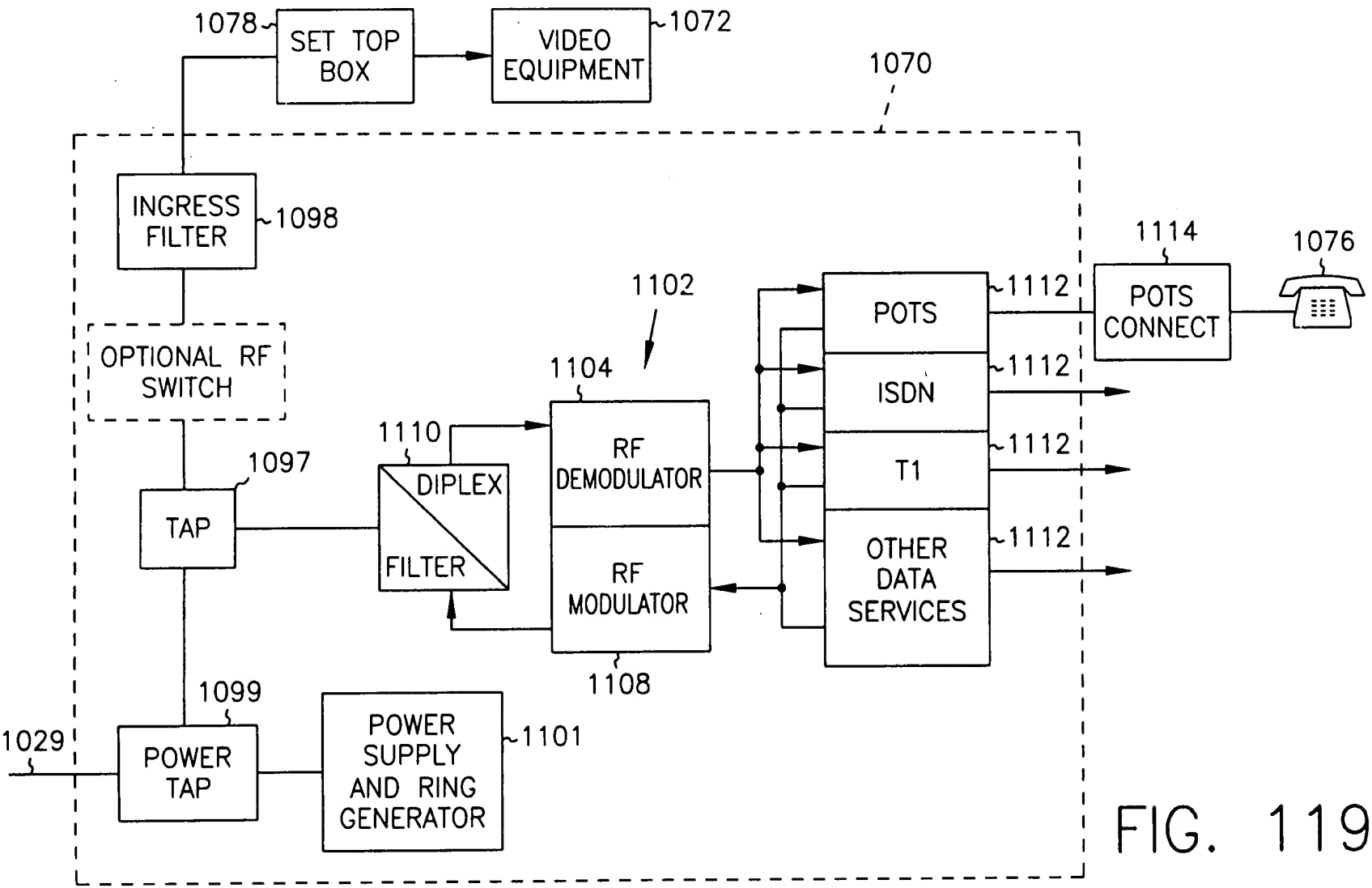


FIG. 119

T06020 "h2ET066D

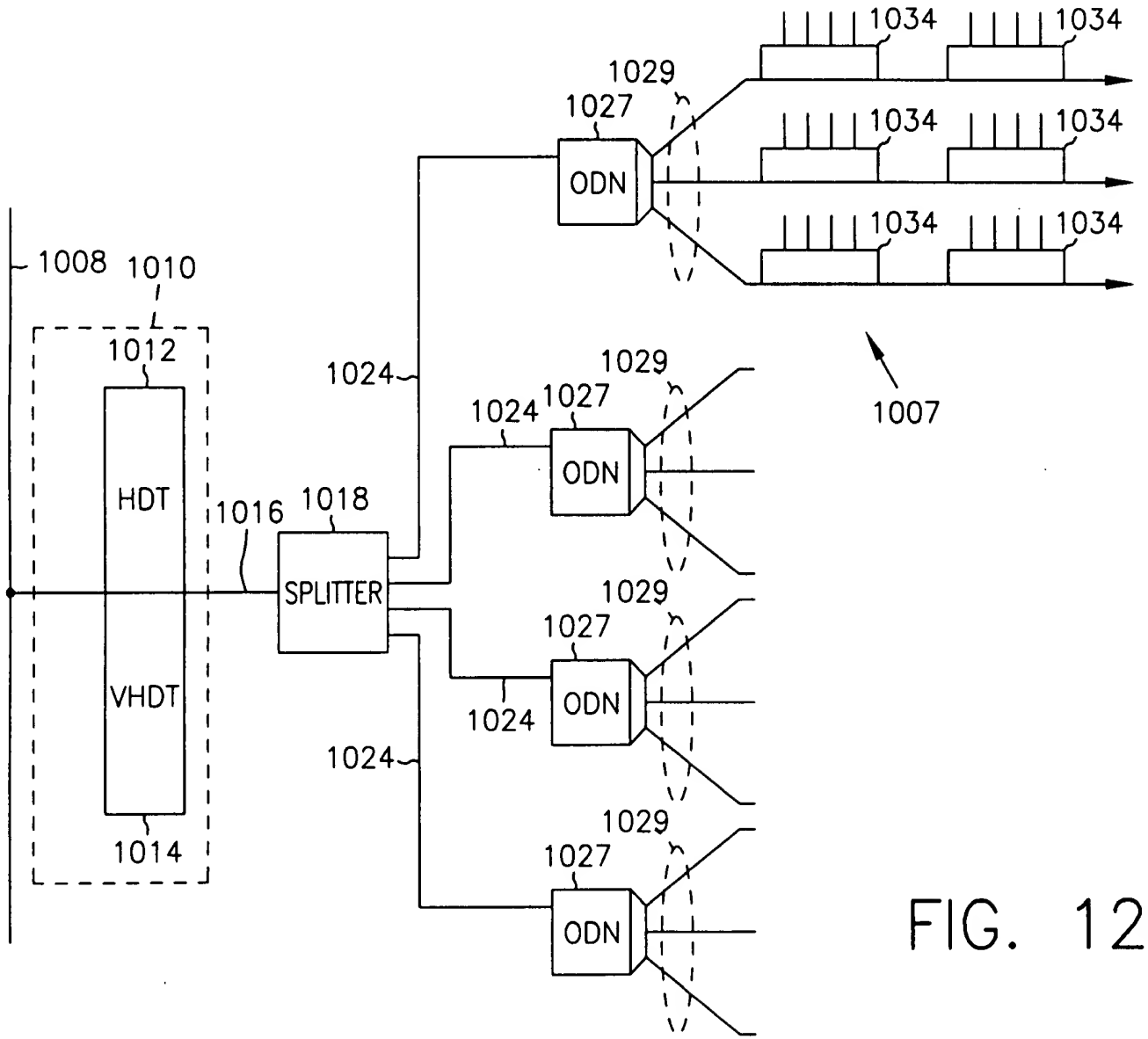


FIG. 120

T06020"h2ET0660

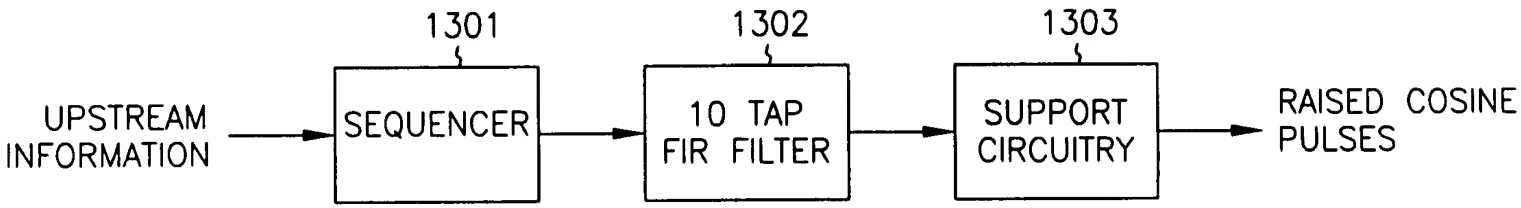


FIG. 121

T06020"h2ET0660

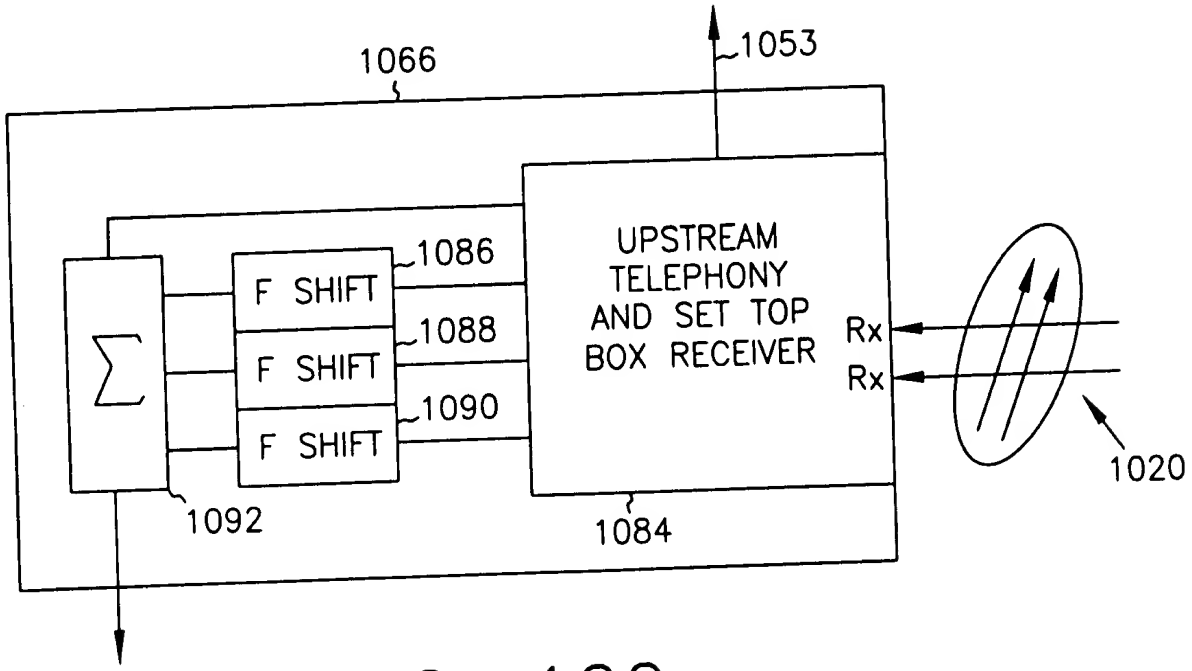


FIG. 122

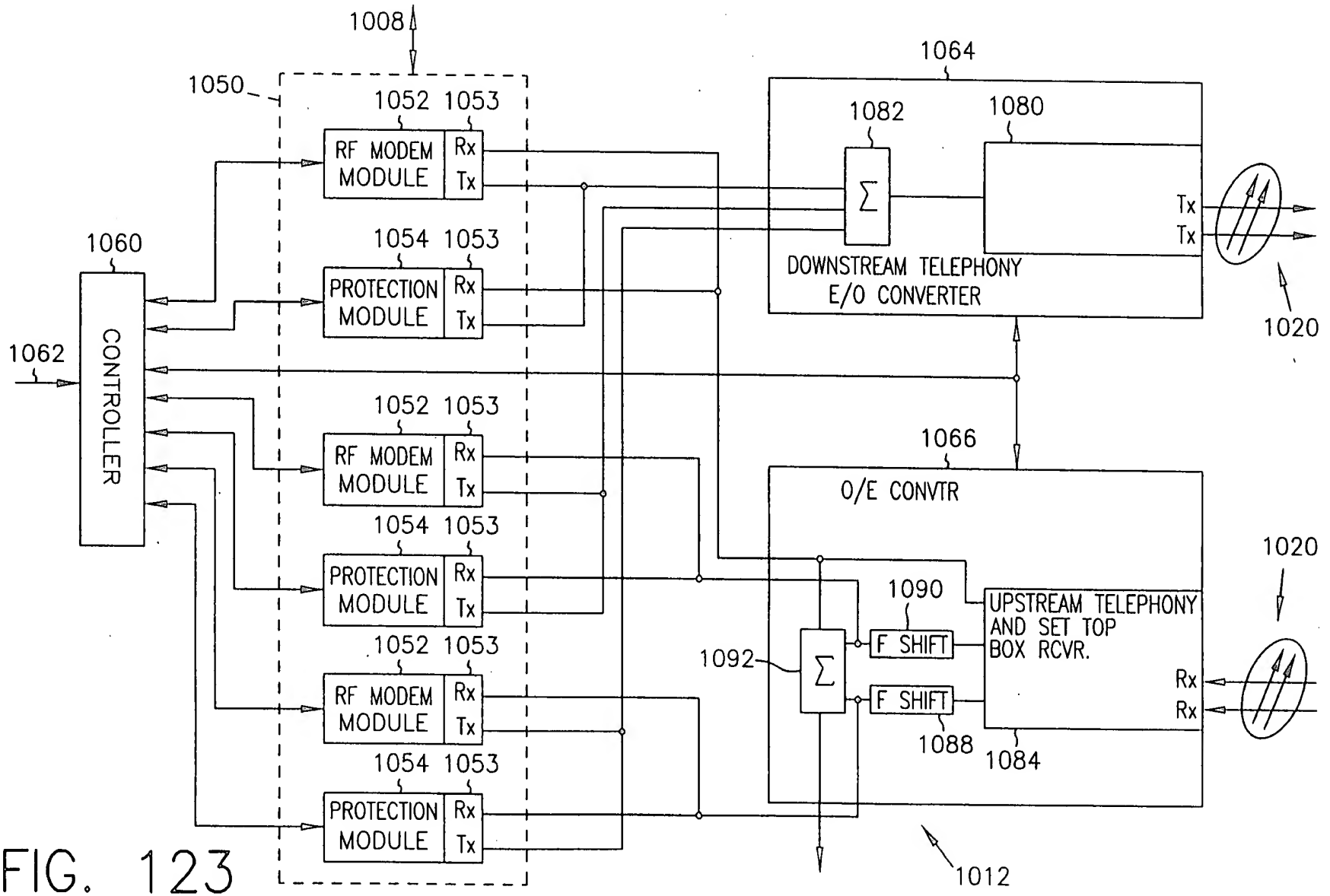

1008
1050
1052 1053
RF MODEM MODULE
Rx
Tx
1054 1053
PROTECTION MODULE
Rx
Tx
1060
CONTROLLER
1062
1064
1082
1080
Σ
Tx
Tx
DOWNSTREAM TELEPHONY E/O CONVERTER
1020
1066
O/E CONVTR
1090
F SHIFT
UPSTREAM TELEPHONY AND SET TOP BOX RCVR.
Rx
Rx
1092
1088
1084
1012

FIG. 123